# A MARKET RESEARCH STUDY OF SOLAR PHOTOVOLTAIC PRODUCTS: AWARENESS, ATTITUDES AND BUYER BEHAVIOUR

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**MANISH GUPTA**

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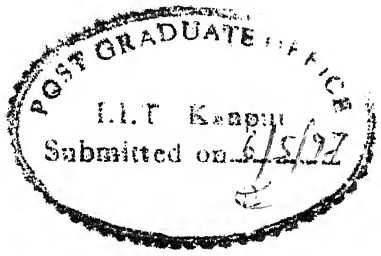
# CERTIFICATE

This is to certify that the work contained in the thesis entitled **"A MARKET RESEARCH STUDY OF SOLAR PHOTOVOLTAIC PRODUCTS: AWARENESS, ATTITUDES AND BUYER BEHAVIOUR"** by Manish Gupta (Roll No. 9511406), has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

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# ABSTRACT

With the energy crisis and worsening pollution problems, non-conventional energy sources are poised to gain wide acceptance. Solar energy being perpetual and pollution free, is being adopted world-wide. However, in India, cost of Solar Photovoltaic option is still on the higher side as compared to other sources of energy and therefore, solar energy has not been commercially exploited to its full extent. As a step towards commercialisation, various government agencies and international organisations such as World Bank are subsidising and supporting the market.

The overall objective of this work is to understand Solar Photovoltaic consumer product segments in India and to develop a marketing strategy for the same. Four products namely: Solar Cap, Solar Car Ventilator, Automotive Solar Charger and Solar Glowsigns were chosen for this purpose. A market research study was conducted to ascertain (1) the level of awareness among people regarding SPV technology and related products (2) their perception and attitude towards these products (3) to understand the buyer behaviour (4) to identify prospective buyers and to determine their demographic profile and (5) to determine their buying motives.

Hypotheses, regarding the points outlined above, were formulated on the basis of study of available literature and discussions held with marketing professionals of companies dealing in SPV products. To test these hypotheses a survey was conducted in Delhi, both among individual buyers (sample size was 100 for each product) and organisational buyers (sample of 25 for Solar Glowsigns). For individual buyers intercept interviews

were carried out at shopping malls, parking lots and college campuses. For organisational buyers personal interviews were carried out. On the basis of the results of hypotheses testing a marketing strategy has been proposed for these products.

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May 97 Manish Gupta

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# 1

# INTRODUCTION

## 1.1 Solar Photovoltaic Energy - Perception in India

Presently, initial cost of setting up a Solar Photovoltaic (SPV) based power plant is very high as compared to a coal-based power plant (approximately 8-10 times). The government is trying to promote SPV by offering subsidies on such systems. However, due to limited resources, such power plants have been confined to unelectrified remote, hilly areas and backward rural areas because low population density does not justify setting up of grid based power plants in these areas. All the efforts (by Government of India and other International Agencies) for disseminating this technology have been primarily confined to rural areas. Emphasis has been on applications such as village street lights, solar lanterns, community TV centres, water pumps for irrigation. On the other hand, in urban areas where grid power is available solar option does not seem to be very attractive (because of high cost). As a consequence PV is perceived as an ideal solution to power problems in rural and hilly areas while it is not considered to be a viable option for urban areas. This thesis looks at SPV as a viable source of clean power both for rural as well as urban populace.

## 1.2 Need for Non-Conventional Sources of Energy

Conventional sources of energy such as oil, coal and natural gas are fast depleting and problem of energy for the coming generations is staring us in the face. According to an estimate, 80% of the world reserves of coal will be consumed by 2250 A.D. and those of oil and natural gas by 2020 A.D. [Sukhatme, 1993]. The energy crisis is further compounded by increasing environmental pollution. Problems of global warming and increased pollutants in air and water are looming large and call for immediate corrective action if we wish to give an inhabitable earth to the future generations. Thus, it is necessary to shift our focus from conventional sources to non-conventional sources of energy which are cleaner and are inexhaustible. The task of developing non-conventional sources into sustainable alternative sources of energy has to be taken up in right earnest.

Various non-conventional sources of energy currently being used are:

1. Hydel
2. Solar Thermal
3. Solar Photovoltaic (SPV)
4. Wind
5. Tidal
6. Biomass
7. Geothermal

Table 1.1 gives cost comparison for some of these sources of energy.

**Table 1.1 : Cost* of Electricity / KWh**

| Source | 1991 (in Rs.) | 1995-2000 (in Rs.) (Projected) |
|---|---|---|
| PV | 11-14.5 | 3.50-7 |
| Wind | 2.50-3.25 | 1.80 |
| Biomass | 1.80 | 1.80 |
| Solar Thermal | 3.50 | 2.90 |
| Geothermal | 1.80-2.50 | 1.80-2.50 |

** Cost in USA*
*Source : EPRI (PVIR, Sept. 91)*

## 1.3 Advantage of PV over other contemporary options

Out of the currently available alternatives SPV seems to be the best because of the following advantages it offers over diesel generators, primary (one-time use) batteries, and conventional grid power :

1. Non-polluting : Because they burn no fuel and have no moving parts, PV systems are clean and silent. This is specially important where the main alternative source of power is diesel generators.

2. Low operating costs : PV module uses sunlight to produce energy i.e. the fuel is free. Since there are no moving parts, the module requires little maintenance.

3. Almost no T&D cost : PV systems are usually placed close to point of use, hence involve low transmission and distribution cost (as well as low T&D losses) .

4. Stand-alone system : With sunlight as the source of energy and little maintenance requirements these systems are suitable for microwave repeater stations in remote/hilly areas, railway signalling, Very Low Power Transmitters (VLPTs), etc.

5. Modular : A PV system is highly modular and lends itself to upgradation and expansion at later stage as the power requirement goes up.

## 1.4 What is Photovoltaic (PV) Technology ?

PV *cell* is the basic component that converts sunlight to electrical energy. This consists of a thin slice of crystalline silicon, called a *wafer*. The wafer may be cut either from *monocrystalline* (single crystal) or *polycrystalline* silicon ingots. The cells are then connected, encapsulated in glass and framed to form a *module*. Modules can also be produced by the deposition of a *thin-film* of photovoltaic material instead of using silicon wafers. The materials being currently used are *amorphous silicon, cadmium telluride* (CdTe) and *copper indium diselenide* (CIS). Figure 1.1 [Derrick et al., 1994], shows current efficiencies of various PV cell technologies, for cases ranging from commercially available products to the theoretical maximum.

Among various thin film technologies available, only amorphous silicon is being widely used for commercial use. CdTe and CIS technologies are still in the development stage and only Matsushita, Japan is employing CdTe technology for commercial production (for calculators and watches). The efficiencies of CdTe and CIS modules are greater than those of amorphous silicon, but they suffer from performance degradation on prolonged exposure to sunlight.

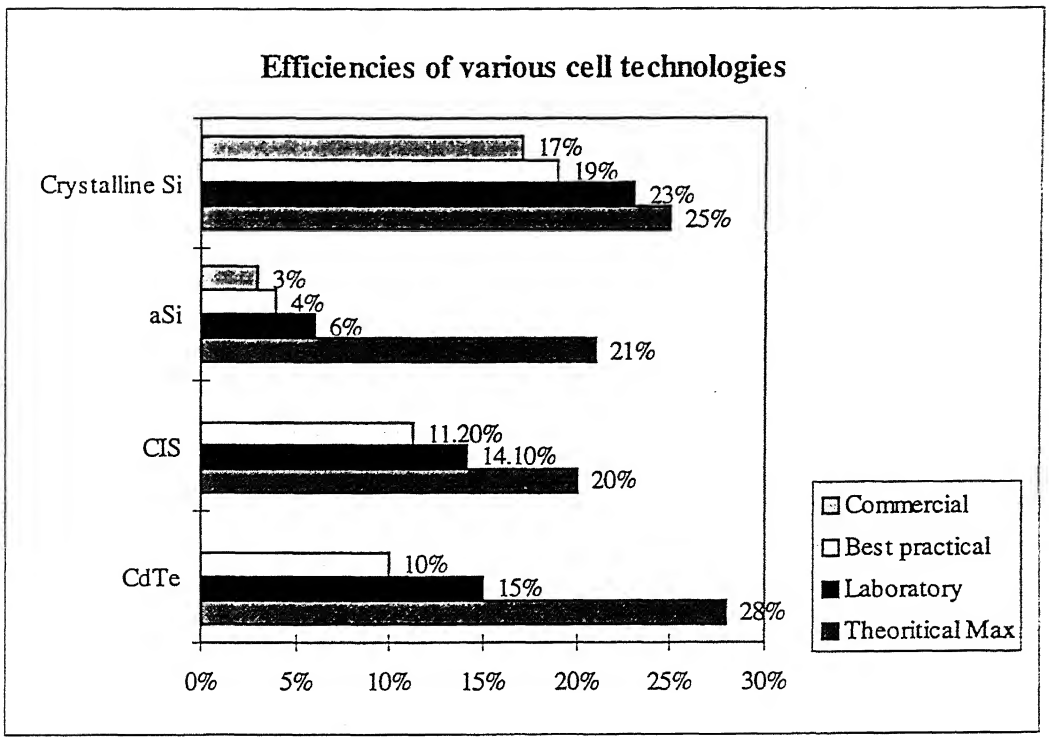


**Figure 1.1 : Efficiencies of Various Cell Technologies**

*(Derrick et al., 1994)*

A complete PV system, to deliver electricity for end use, has a variety of components in addition to the PV module. These are collectively referred to as the balance-of-system (BOS). Depending on the system, BOS may include a storage battery; a charge controller; an inverter; module support structure; and a variety of cables, connectors, switches, junction boxes, etc. BOS usually accounts for about 40 to 50% of the total system cost [Derrick et al., 1994].

PV systems with batteries operate by connecting the PV module to a battery, and the battery, in turn, to the load. During day time, the battery is charged by the module and battery supplies power to the load as and when required. An electronic charge controller is used to protect the battery from excessive charging and discharging. The module generates DC, an inverter is used to convert it to AC, if required. Generally a loss of 15 - 20% of the rated module output is taken as the norm. Further losses occur in charging and

discharging the battery. The general overall efficiency of the charge-discharge cycle is about 80%. So the final output of electricity is about 70% of that derived from the rated output of the module [Derrick et al., 1994].

## 1.5 World PV Market - An Overview

PV industry is characterised by falling prices and increasing efficiency of module in particular and systems, in general. Figure 1.2 [Derrick et al., 1994], shows the world PV module production for last ten years.

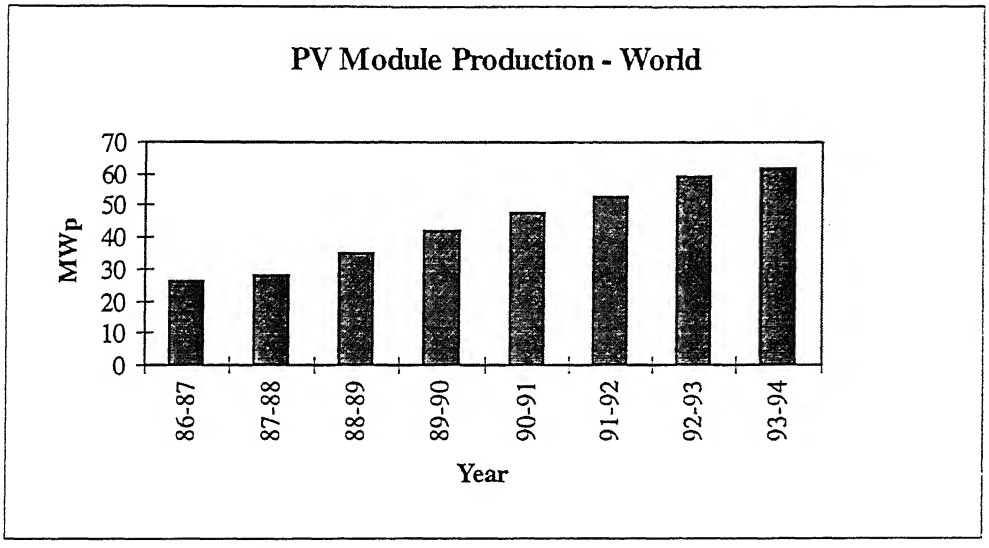


**Figure 1.2 : PV Module Production-World**

*(Derrick et al., 1994)*

Most of the development in photovoltaics is taking place in developed countries, with Japan leading the pack and closely followed by the US. Crystalline Si technology accounts for about 70% of all the solar cells and is followed by amorphous Si (thin-film) technology. CdTe technology is still in the nascent stage and constitutes a measly 1.7% of commercially produced solar cells. Concentrators are used only in special applications

like satellites etc. and hence constitute just 0.1% of the total market. Table 1.2 [Derrick et al., 1994], shows technology-wise and region-wise break-up of the current PV market.

**Table 1.2 : Market Break-up By Technology (in 1994)**

| Region | Crystalline | Amorphous | CdTe | Concentrators | Total (MWp) | % Share |
|---|---|---|---|---|---|---|
| Europe | 16.0 | 0.6 | 0 | 0 | 16.6 | 28.02 |
| US | 14.2 | 4.0 | 0 | 0.05 | 18.25 | 30.80 |
| Japan | 7.8 | 10.0 | 1.0 | 0 | 18.8 | 31.73 |
| Rest of world | 3.7 | 1.9 | 0 | 0 | 5.6 | 9.45 |
| Total (MWp) | 41.7 | 16.5 | 1.0 | 0.05 | 59.25 | |
| % Share | 70.4 | 27.8 | 1.7 | 0.1 | | |

*Source : Derrick et al., 1994*

World market of SPV products can be divided into 6 major segments namely consumer products (<1Wp), consumer products (<50Wp), remote industrial applications, rural applications, grid connected (1KWp - 10 KWp) power plants and independent power plants (<50KWp). Consumer products include calculators, watches, lights, security alarms and other novelties. These products, in general, are used as novelty items and are not indispensable (substitutes running on conventional power or batteries may be used). Estimated market for these products was 12 MW in 1990 and is projected to reach 29 MW in year 2000.

On the other hand, remote industrial applications such as in telemetry, telecommunication, signalling, off-shore platforms and rural applications such as in pumping, vaccine refrigeration, lighting etc. are real utility products and often are the only

viable source of power and hence are indispensable. Market size of these products was about 30 MW in 1990 and is projected to shoot up to 170 MW by year 2000. These figures indicate that worsening power situation all over the world will lead to increased use of solar power. Solar power plants are also used for generating power in areas where grid connection is not available and cost of setting up of transmission lines (for integrating with the grid) is prohibitive. The market size for such plants was mere 4 MW in 1990 (because of high initial cost) but with improving technology and falling prices the market is expected to grow to about 40 MW by year 2000. Table 1.3 [Derrick et al., 1994] shows size, of various segments of world PV market, in wattage and dollar terms.

**Table 1.3 : PV World Market Segmentation**

| Market Segment | Products | 1990 | | | 2000 (Projected) | | |
|---|---|---|---|---|---|---|---|
| | | MW | $/W | mn$ | MW | $/W | mn$ |
| Consumer Products (< 1 Wp) | Calculators, watches, & novelties | 4 | 14 | 56 | 5 | 12.9 | 65 |
| Consumer Products (< 50 Wp) | Auto app, lights, security systems | 8 | 7 | 56 | 24 | 5.13 | 123 |
| Remote Industrial (1 Wp - 1KWp) | Telecom, telemetry, signalling | 12 | 5.9 | 71 | 40 | 4.19 | 168 |
| Remote Villages (100 Wp - 1KWp) | Pumping, irrigation, refrigeration, lighting | 18 | 5.7 | 103 | 130 | 3.24 | 421 |
| Grid Connected (1KWp - 10 KWp) | | 2 | 5.5 | 11 | 24 | 2.71 | 65 |
| Central Power Plants (< 50 KWp) | | 2 | 4.7 | 9 | 16 | 2.59 | 41 |

*Source : Derrick et al., 1994*

## 1.6 Indian PV Industry

### 1.6.1 What is the Structure of Indian PV Industry ?

The Indian PV industry has come a long way since early 1980s, when this technology was introduced for commercial applications. Module production has grown to seven times its value in 1990, over a period of just 6 years. Figure 1.3 [Sastry, Bist and Bhargava, 1996], gives production trend for last six years. Last year module production was 8.5 MWp.

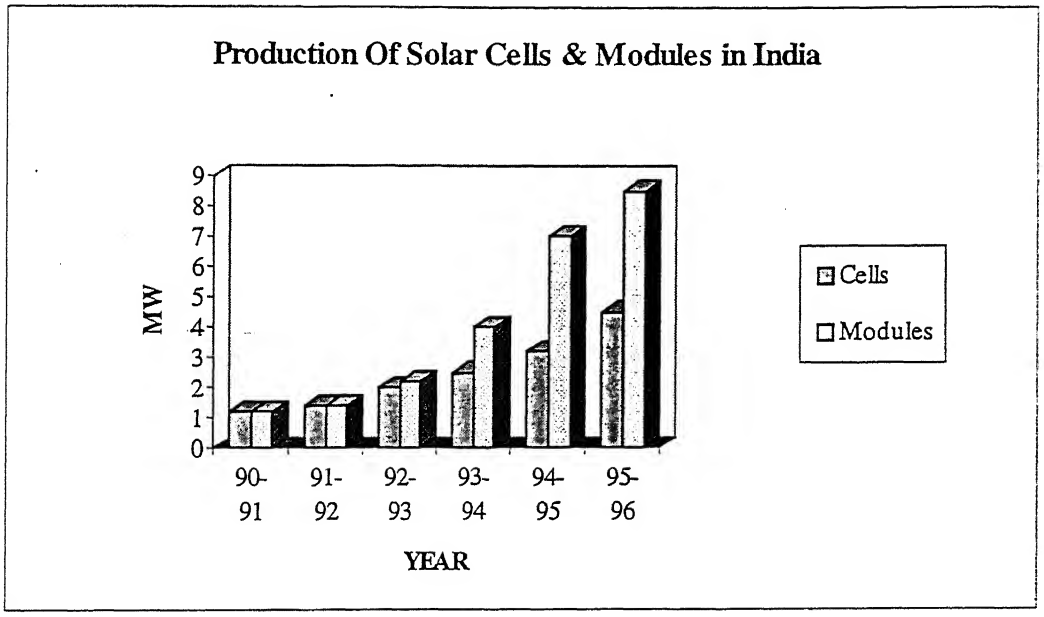


**Figure 1.3 : Production of Solar Cells & Modules in India**

*(Sastry et al., 1996)*

There are five main manufacturers of PV modules in India namely Renewable Energy Systems Ltd. (RES), Central Electronics Ltd. (CEL), Rajasthan Electronics & Instruments Ltd. (REIL), TATA-BP Solar Ltd. and Bharat Heavy Electricals Ltd. (BHEL). Together they produce about 82% modules in India. Figure 1.4 [Sastry et al., 1996] indicates module production capacity of major manufacturers in 1995-96.

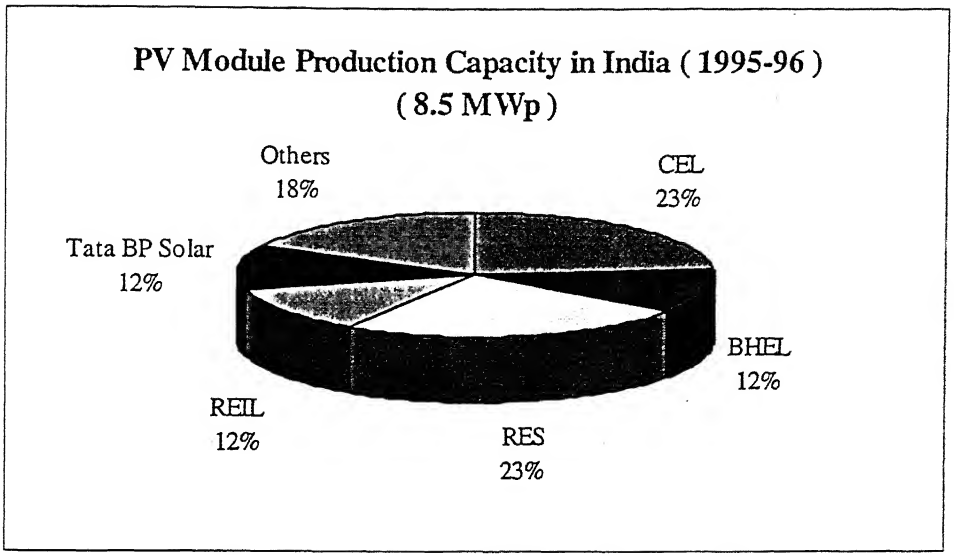


**Figure 1.4 : PV Module Production Capacity in India**

*(Sastry et al., 1996)*

The size of Indian PV market last year was Rs. 2770 million. This includes sale of PV modules, cells and systems manufactured in India as well as imported. Renewable Energy Systems Ltd. is the current market leader with a market of Rs. 88.6 crore and is closely followed by BHEL with a market of about Rs. 80 crore. Figure 1.5 [Sastry et al., 1996] indicates market shares of key players (value wise).

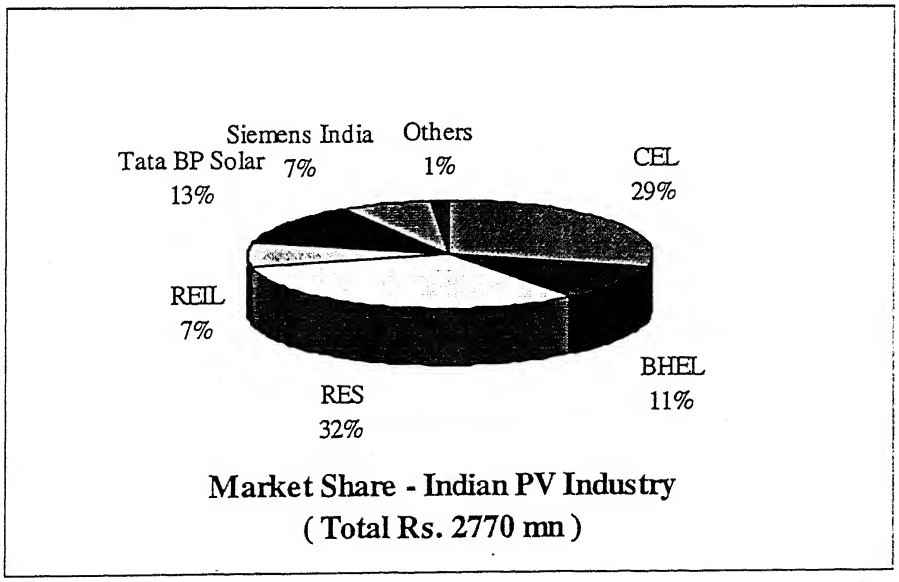


**Figure 1.5 : Market Share**

*(Sastry et al., 1996)*

### 1.6.2 Dissemination of PV Technology in India

The difficulty in providing grid electricity, on a sustained basis, to customers in many parts of the country has created a favourable environment for exploitation of locally available renewable sources of energy to cater to the energy needs of the people in such areas. However, due to high initial costs associated with SPV, dissemination of this technology has been mainly confined to areas that are covered under demonstration programme or some other government sponsored scheme for aiding commercialisation of this technology. Nevertheless, SPV has a promising future because it is expected that once pricing and distribution of energy from conventional sources is rationalised, SPV would compare favourably with other options (considering the other associated benefits of this technology) and there would be a quantum jump in its demand.

### 1.6.3 Applications of Solar Photovoltaic Energy

#### 1.6.3.1 PV Use in India

The number of installed PV applications upto 1996, [Sastry et al., 1996] are as given below:

| | | |
|---|---|---|
| 1. | Street lights | 30,917 |
| 2. | Domestic lights | 36,517 |
| 3. | Solar lanterns | 73,526 |
| 4. | Community TV/ lights | 921 |
| 5. | Village power plants | 166 (909 KW) |

6. PV pumps for irrigation 1,318

*Source: Sastry et al., 1996*

### 1.6.3.2 Other PV Applications

1. PV systems for rural telephones
2. Microwave repeater stations
3. Railway signalling
4. Unmanned railway crossings
5. Very low power transmitters (VLPTs)
6. Off-shore well head oil platforms
7. Cathodic protection for oil and gas pipelines
8. Refrigeration for vaccine preservation
9. Water purifiers
10. Battery charging
11. Consumer applications

*Source: Sastry et al., 1996*

Figure 1.6 [Sastry et al., 1996], gives sector wise application of PV energy.

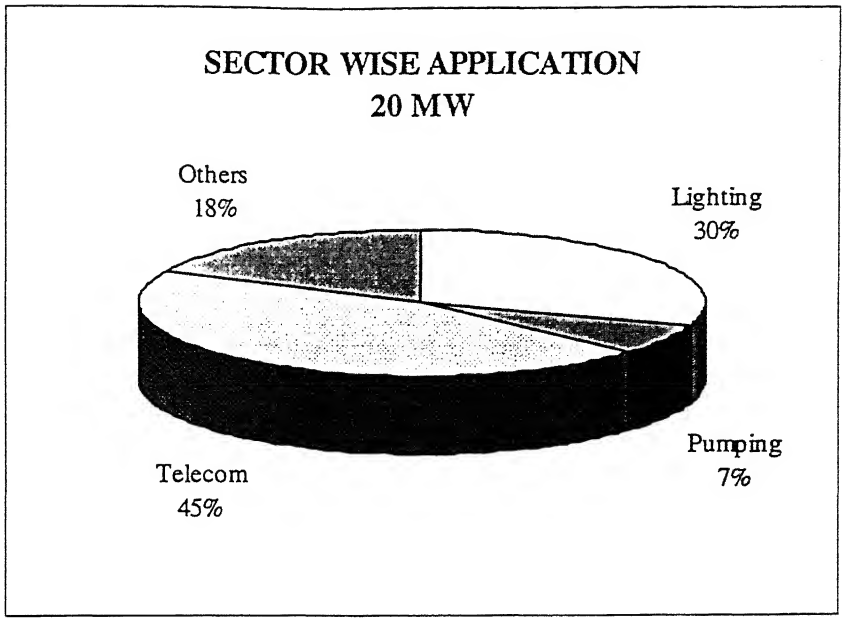


**Figure 1.6 : Sector-wise Application**

*(Sastry et al., 1996)*

### 1.6.4 Government Support Programmes for Commercialisation of PV Technology

As of today PV technology is costly as compared to other sources of energy and is out of reach of most of the people, hence to popularise its use government is supporting the dissemination programme by providing subsidies and various other kinds of benefits. The main implementing agencies are Ministry of Non-conventional Energy Sources (MNES), Indian Renewable Energy Development Agency (IREDA) and various State Nodal Agencies. World bank is also funding some schemes for aiding the dissemination and commercialisation of PV technology.

### 1.6.5 Fiscal Incentives Offered by IREDA and Other Nodal Agencies

1. Concessional import duty

| | |
|---|---|
| Capital equipment | 25% |
| Materials | 15% |
| Cells, Modules, Systems | 35% |

2. Excise duty exemption for cells, modules and many PV systems.
3. Sales tax exemption in most states.
4. 100% depreciation during first year.
5. Soft loan for manufacturers and users

Applications : 2.5% (for rural applications) 5% (for urban applications)

Manufacturing: 10.3%

Repayment period is 8 years (including 1 year moratorium)

*Source: Sastry et al., 1996*

## 1.7 Focus of Thesis

Focus of the present work is to understand (a) corporate adoption behaviour and (b) individual adoption behaviour of SPV products. We have attempted to address the following issues:

1. The level of awareness among people (organisations and individual) regarding SPV technology and related products.

2. People's perception and attitude towards SPV products.

3. To understand their buyer behaviour (specially the criteria used to evaluate these products and their buying motives).

4. Identification of prospective buyers and determination of their demographic profile.

To carry out the study four products namely: Solar Glowsigns, Solar Cap, Solar Car Ventilator and Automotive Solar Charger (refer Appendix A) were chosen. These products were selected on the basis of discussions with experts in the field of SPV technology with special emphasis on applicability, utility (in the Indian conditions) and price of the product. Rationale of selection of these products is outlined below:

1. Solar Glowsigns: In many cities of India, use of electricity for advertising during peak demand hours is prohibited. As a consequence use of lighted signboards and glowsigns is becoming increasingly difficult. Moreover, there has been a recent trend of using the concept of environment friendliness by various companies to create a favourable image. Keeping in view these factors it was felt that Solar Glowsign could be a relevant product to study in the Indian market.

2. Solar Cap: Most parts of India experience long periods of heat and sunshine. Also in cities wearing cap has become a fashion. So Solar Cap was included in the our list of products.

3. Automotive Solar Charger and Solar Car Ventilator: Starting trouble in winters (specially in cars with old batteries) is a common problem. Also, long period of disuse

leads to running down of the battery which causes starting trouble in cars. Automotive Solar Charger solves these problems. Besides, due to lack of adequate shaded parking spaces in cities it was felt that Solar Car Ventilator may be a product whose adoption behaviour could be relevant to look into.

# 2

# LITERATURE REVIEW

## 2.1 Consumer Behaviour: Implications for Marketing Strategy

Consumer Behaviour is defined as the set of activities that people engage in when selecting, purchasing and using products and services so as to satisfy their needs and desires. Such activities involve mental and emotional processes, in addition to physical actions [Wilkie, 1986].

The philosophy that marketing strategies rely on a better knowledge of the consumer needs is known as the *marketing concept.* It states that marketers must first define the benefits consumers seek in the marketplace and then gear their marketing strategies accordingly [Assael, 1995]. As the marketing concept has gained widespread acceptance, it has been recognised that the determinants of consumer behaviour (i.e. consumer's needs, perceptions, attitudes and intentions) have a direct bearing on the formulation of marketing strategies. It is in this backdrop that it is being said that knowledge of consumer behaviour is a prerequisite for formulation of effective marketing strategies.

## 2.2 A Model of Consumer Behaviour

Consumer decision making i.e. the process of perceiving and evaluating brand information, considering how brand alternatives meet the consumer's needs, and choosing a brand, is the central component of the model of consumer behaviour outlined in figure 2.1 [Loudon & Bitta, 1988].

Mainly two sets of factors determine consumer's choice. First is the individual consumer whose needs, perceptions of brand characteristics, attitude towards alternatives, lifestyle and personality characteristics influence brand choice.

The second set of factors that influence consumer decision making is the environment. It is represented by culture (the norms of society and the influences of regional subcultures), social class (the broad socio-economic group to which the consumer belongs) and face-to-face groups (friends and family members).

Communication from environment to the consumer is necessary to influence consumer choice. This communication is mainly from friends and family and from marketing organisations. Communications from marketing organisations are stimuli conveyed through product offerings, advertising or by salespersons that are perceived and evaluated by the consumer in the process of decision making. Marketing research provides information to marketing organisations on consumer needs, perceptions of brand characteristics and attitude towards brand alternatives. This information is further used to develop marketing strategies.

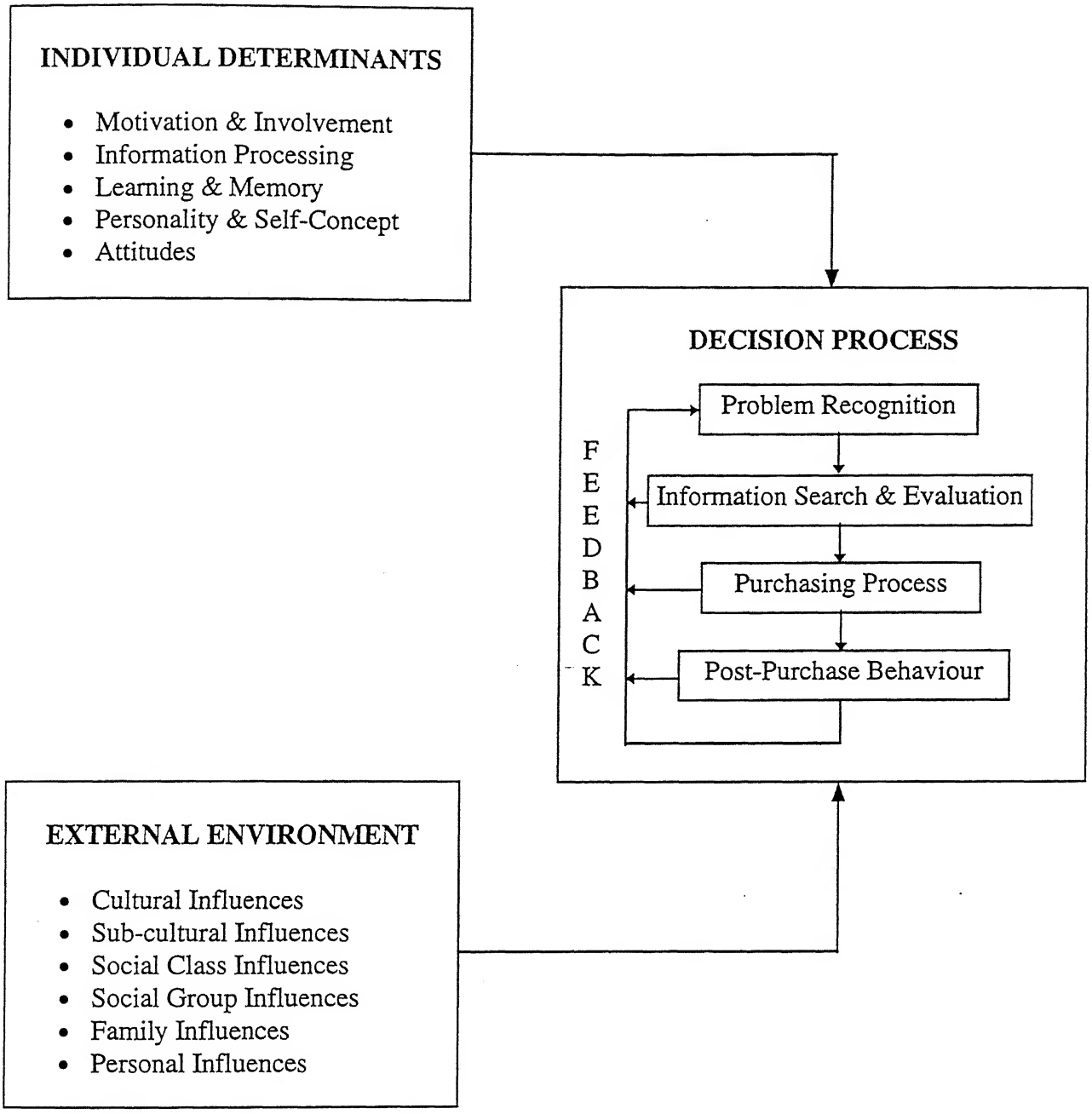


**Figure 2.1 : A Model of Consumer Behaviour**

*(Loudon & Bitta, 1988)*

Once the purchase decision has been made post purchase evaluation takes place. During evaluation, the consumer learns from his/her experience and may change the pattern of acquiring information, evaluating brands and selecting a brand. This is shown as feedback in figure 2.1.

## 2.3 Consumer Decision Making

The consumer decision making process must be understood properly to develop sound marketing strategies. Consumer decision making is not a standardised process. Figure 2.2 presents a typology of consumer decision making [Assael, 1995], based on 2 dimensions (1) the extent of decision making and (2) the degree of involvement in purchase. The first dimension represents a continuum from decision making to habit. Consumers may base their decisions on cognition (thought). On the other hand, little or no decision making may take place when the consumer is satisfied with a particular product or brand and buys it consistently as a matter of habit.

The second dimension represents a continuum from high to low involvement purchases. High involvement purchases are those that are important to the consumer. They are closely related to consumer's ego and self image. They involve some risk to the consumer: financial, social (products important to the peer group) or psychological (wrong decision might cause anxiety and concern). In such cases, consumers may spend time and energy to carefully evaluate product alternatives. Low involvement purchases are not as important to the consumer and financial, social and psychological risks are not as great. In such cases, consumers may not find it worthwhile to spend time and energy to

search for information about brands and choose among them. Hence, such purchases involve limited decision making process.

Figure 2.2 depicts 4 types of consumer purchase processes based on the 2 dimension discussed above. The first one, called Complex Decision Making, takes place when involvement is high and decision making does occur. In such cases, consumer actively searches for information to evaluate and consider alternative brands. However, this does not happen everytime a brand is purchased. When there is a sense of satisfaction the choice is repetitive, with almost no decision making and this is called brand loyalty.

| | **High Involvement Purchase Decision** | **Low Involvement Purchase Decision** |
|---|---|---|
| **Decision Making** | Complex Decision Making | Limited Decision Making |
| **Habit** | Brand Loyalty | Inertia |

**Figure 2.2 : Consumer Decision Making**

*(Assael, 1995)*

The figure also shows 2 types of purchase processes where involvement is low. Decision in a low involvement condition is characterised by limited decision making. Consumers sometimes go through a decision process in buying, even though they are not highly involved with the product. This happens because they have little experience with that product. The consumer examines the product in the shop and purchases it on a trial basis.

In making such a purchase, the consumer makes limited information search and brand evaluation as compared to purchase involving complex decision making.

The fourth choice process is inertia or low involvement with the product and no decision making. Inertia means the consumer is buying the same brand, not because of brand loyalty, but because it is not worth the time and trouble to search for an alternative [Robertson, 1976].

Limited decision making is also likely to take place when consumers seek variety. When involvement is low, consumers are more likely to switch brands out of boredom and in search of variety. This is called variety seeking behaviour [Venkatesana, 1973].

## 2.4 Impulse Buying

Another aspect of purchase process is impulse buying. Traditionally impulse buying refers to purchase decisions that are made after the consumer enters a retail environment [Rook, 1987]. Although the terms "impulse buying" and "unplanned purchase" are used interchangeably, it must be emphasised that unplanned purchases may involve decision making processes as rational as those associated with planned purchase [Berkman & Christopher, 1986]. While on the other hand impulse buying occurs when a consumer experiences a sudden, often powerful and persistent urge to buy something immediately. Also, impulse buying is prone to occur with diminished regard for its consequences [Rook, 1987].

Stern (1962) has suggested that there are 4 types of impulse buying:

1. **Pure Impulse**: It refers to the act of buying something novel and is usually a departure from patterns of brand loyalty or typical buying behaviour.

2. **Reminder Impulse**: When a consumer sees an item and is reminded that the stock at home needs replenishment, or recalls an advertisement or other information about the item and a previous decision to purchase then it is called reminder impulse.

3. **Suggestion Impulse**: A product that the consumer encounters for the first time may stimulate a perceived need for it. Such type of impulse is referred to as suggestion impulse.

4. **Planned Impulse**: It occurs when the buyer enters the shop with the expectation and intention of making some purchase on the basis of special price, discount, gifts, etc.

Impulsive consumer behaviour may be characterised by the following [Loudon & Bitta, 1988]:

1. The consumer has spontaneous desire to act and it involves a marked departure from previous behaviour.

2. This sudden desire to buy puts the consumer in a state of psychological disequilibrium where he temporarily feels out of control.

3. The consumer may experience psychological conflict and struggle weighing the immediate satisfaction against the long-term consequences of the purchase.

4. Consumers reduce their cognitive evaluation of product features.

There are several product, marketing and consumer characteristics which appear to have influence on impulse purchases. Products which are lowly priced, for which there is a marginal need, which have a short life and are small in size or light weight have greater

influence on impulse buying. According to Stern, marketing factors which influence impulse buying include mass distribution in self-service outlets with mass advertising and point-of-sale materials, prominent display position and store location. Kollat (1966) and Bellenger have shown that various consumer personality and demographic characteristics are also related to the rate of impulse buying.

## 2.5 New Product Introduction

### 2.5.1 What is a New Product?

A product may be called new either because it is new from consumer's point of view or is new from manufacturer's point of view.

#### 2.5.1.1 Consumer's Viewpoint

According to Robertson (1967), new products are classified according to the degree of behavioural change or new learning required by the consumer in order to use the product. This looks at newness in terms of its effect on the consumer rather than whether the product is new to a company, is packaged differently, has changed physical characteristics or is an improved version of an existing product.

The continuum proposed by Robertson is shown in figure 2.3. It shows 3 categories based on the disrupting influence of new product usage on established consumption patterns.

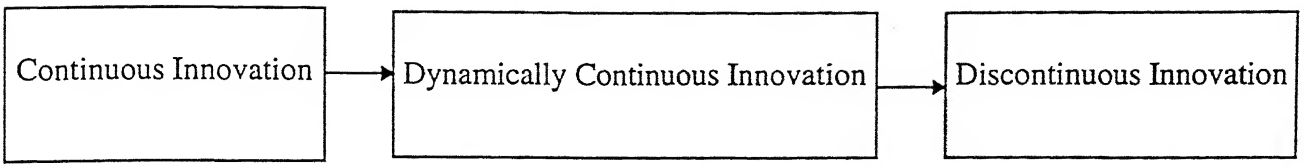


**Figure 2.3 : Continuum for Classifying New Products**

*(Robertson, 1967)*

Mostly new products fall at the continuous end of the continuum, examples are auto-focus cameras, liquid soap dispenser, gel toothpaste etc. Products such as CDs, Walkman, cordless telephone fall in the category of dynamically continuous innovations. The truly new products such as cellular phone, pagers etc. are called discontinuous innovations and require a great deal of new learning by the consumer. These products perform either previously unfulfilled function or an existing function in a new way.

### 2.5.1.2 Firm's Viewpoint

The innovative firm, in addition to recognising the consumer's perception of newness, may also classify its new products on some other dimensions. One such classification of new products is shown in figure 2.4 [Hisrich & Peters, 1991].

In this framework a distinction is made between new products and new markets (i.e. market development). New products are defined in terms of improved technology whereas market development is based on segmentation.

Increased Technological Newness ⟶

| Increased Market Newness ↓ | No Technological Changes | Improved Technology | New Technology |
|---|---|---|---|
| **No Market Change** | | **Reformulation**: Change in formula or physical product to optimise cost & quality. | **Replacement**: Replace existing product with new one based on new technology. |
| **Strengthened Market** | **Remerchandising**: Increasing sales to existing customers. | **Improved Product**: Increased utility to customers. | **Product Life Extension**: Add new similar products based on new technology to serve more customers. |
| **New Market** | **New Use**: Add new segments that can use present products. | **Market Extension**: Add new segments by modifying present products. | **Diversification**: Add new markets with products based on new technology. |

**Figure 2.4 : Classification of New Products**

*(Hisrich & Peters, 1991)*

## 2.5.2 Adoption Decision

Adoption of an innovation requires an individual to make a purchase decision for a new product. This decision is likely to be an involved one. The steps of adoption process are shown on the left of figure 2.5 and reflect high involvement. These steps parallel those in the process of complex decision making, shown on the right in figure 2.5 [Assael, 1995].

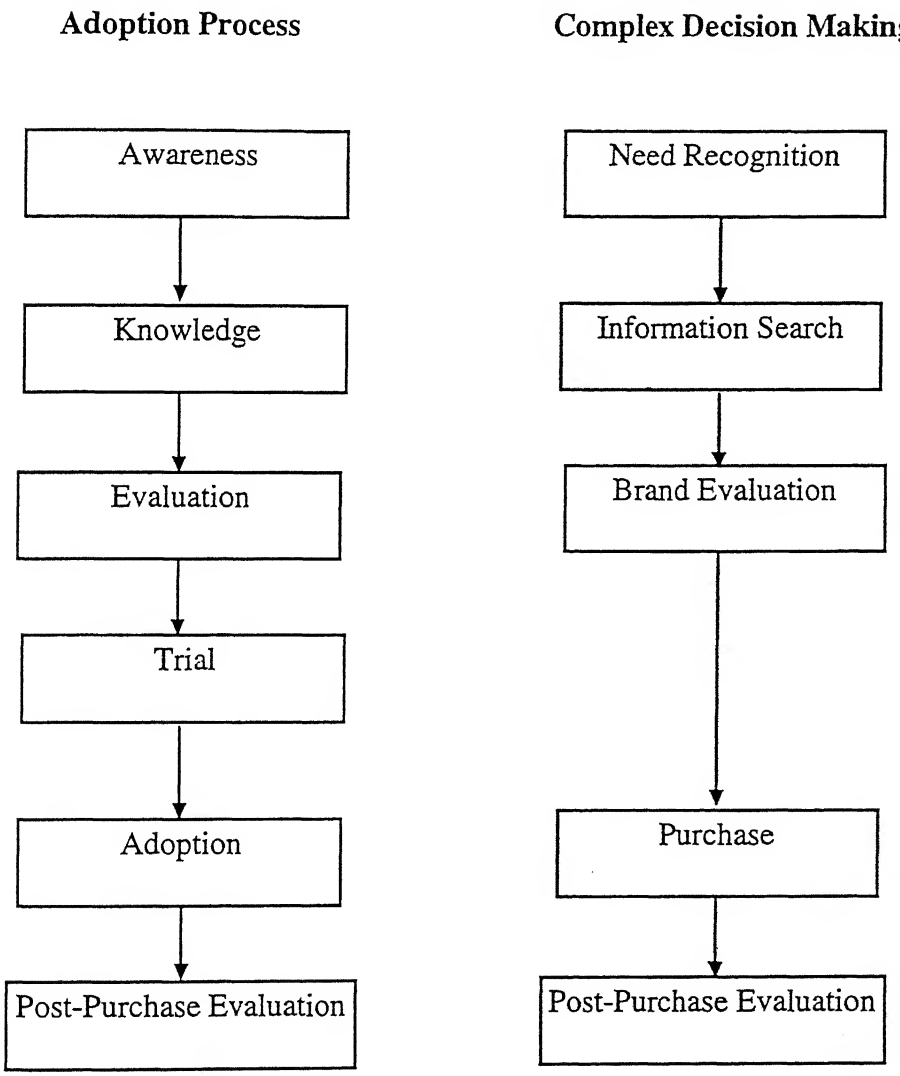


**Figure 2.5 : Steps in the Adoption Process**

*(Assael, 1995)*

The consumer recognises a need for the product (awareness), searches for information (knowledge acquisition), evaluates the alternatives, ,makes a decision whether to adopt or not and evaluates the product after the purchase. One element in the adoption decision that makes it distinct from complex decision making is the importance of product trial. Product trial is likely to be more important because the product is new and hence risk is likely to be higher.

Acceptance of a new product and the effect of the promotional campaign can be assessed on the basis of answers to the following questions: To what degree is the public aware of the new product? What are consumers' attitudes towards the innovation? What is the likelihood of trial and subsequent adoption? Are consumers satisfied after adopting the innovation?

### 2.5.3 Factors That Encourage Adoption

Rogers and Shoemaker (1971) have identified the following five characteristics that increase the rate of acceptance of a new product:

1. **Relative Advantage**: It is the degree to which consumers perceive a new product as superior to existing substitutes.
2. **Compatibility**: It is the degree to which the product is consistent with consumers' needs, attitudes and past experiences.
3. **Simplicity**: It is the ease in understanding and using a new product [Hirschman, 1980].
4. **Observability**: It is the ease with which the product can be observed and communicated to the potential consumers. Products that are highly visible are more

easily diffused[1]. Fisher and Price (1992) have found that when early adopters purchase a new product that is observable, it allows them to associate themselves with desirable groups.

5. **Triability**: It is the degree to which a product can be tried before adoption. Discontinuous innovations generally have little triability. However, if consumers can purchase a product in small quantities, then trial is relatively easy.

Studies of these 5 factors generally agree that relative advantage and compatibility are most important in influencing adoption of an innovation. LaBay and Kinnear (1981) have found that adopters of solar energy systems rated these systems significantly higher than non-adopters did on relative advantage, compatibility and simplicity. Ostlund (1974) has found that consumer's perceptions of the product's characteristics are much more important than the consumer's demographic and personality characteristics in predicting adoption. This finding suggests that individuals are more likely to adopt an innovation because of perceived advantages (of the product) rather than their personal characteristics.

### 2.5.4 Factors That Encourage Rejection

Absence of any of the five factors listed in the previous section could cause rejection of a new product. Ram & Sheth (1989) have considered these factors in citing three major barriers to adoption of an innovation:

1. **Value Barrier**: Value barrier is a product's lack of performance relative to price as compared to substitute products. Manufacturers can overcome this in two ways. First, by reducing the price through technological advances. Second, by conveying

[1] Diffusion is the process by which the adoption of an innovation is spread over time to members of a target market by communication.

information to consumers through advertising to convince them of the product's value.

2. **Usage Barrier**: A usage barrier occurs when a product is not compatible with consumer's existing practices or habits. It may be difficult to overcome such a barrier because the innovation may be contrary to the ingrained needs and usage habits. However, change agents[2] may be employed to overcome such usage resistance.

3. **Risk Barrier**: A risk barrier represents consumer's physical, economic, performance or social risk of adopting a new product. One of the most effective ways to reduce consumer risk in adopting an innovation is through trial.

### 2.5.5 Characteristics of Innovators

Rogers (1962) describes innovators as the first 2.5% of all those who adopt a new product. The percentage may vary from 2% to 5% depending on the product. Though the profile of an innovator is product specific, a general innovator is likely to exist. Following sections discuss the personality, demographic and media characteristics of the general innovator.

#### 2.5.5.1 Personality Characteristics

Riesman, Glazer and Denney (1950) have found innovators to be inner directed. Such people tend to rely on their internal standards and values to guide their behaviour; outer directed people rely on the values of friends and associates. Innovators are more likely to be self-confident in evaluating new products [Brittingham, 1989]. They have been found

[2] Change agents are opinion leaders who have more influence and credibility than commercially sponsored means such as personal selling and advertising.

to be less dogmatic than non-innovators. Dogmatism, which is related to perceived threat and anxiety, is reflected in a closed mind towards change. Less dogmatic individuals are more likely to accept change and innovations requiring changes in behaviour.

### 2.5.5.2 Demographic Characteristics

Innovators tend to be young, have high income, educational level and occupational status. This profile has been found to be true for innovators of solar energy systems also [LaBay and Kinnear, 1981].

### 2.5.5.3 Media Characteristics

Innovators are more likely than non-innovators to read newspapers and magazines. However, findings for print media do not apply to radio and TV. Innovators are not more likely to be exposed to broadcast media [King, 1965]. Because innovators tend to watch less TV than the general population, it is an ineffective medium for reaching adopter groups.

### 2.5.5.4 Perceived Risk and Product Involvement

Innovators tend to perceive less risk in product adoption than do non-innovators. They also are less likely to be concerned with negative consequences such as disapproval of the product by friends and relatives [Lambert, 1972].

## 2.6 Marketing of Green Products

Green products tend to be more expensive because of higher manufacturing costs and R&D that goes into creating these products. As long as green products are a novelty, shoppers are willing to spend more to test them, but as time passes, they begin to apply the same value and quality standards to green products as to any other product.

Thus one has to give consumers of green products value plus 'green'. When shoppers say that they prefer to buy green, they mean that they will choose an environment friendly product if it can compete with their regular brand on the basis of quality and price.

*Sources*: "Green Commitment: Fading Out?" Progressive Grocer (December 1992), p. 5; "The Color of Money," Superbrands (1992), p. 30; "Green Product Sales Seems to be Wilting," *The Wall Street Journal* (May 18, 1992), p. B1.

# 3

# HYPOTHESES

## 3.1 Introduction

This chapter involves development of hypotheses on the basis of study of available literature on this subject and discussions held with marketing professionals of companies dealing in solar photovoltaic (SPV) products. Based on these discussions, the proposed hypotheses are outlined below. These are focussed on (a) the adoption of Solar Glowsigns by companies, and (b) the adoption of SPV products (specially Solar Cap, Automotive Solar Charger, Solar Car Ventilator) by individuals.

## 3.2 Organisational Buyers

**Hypothesis OB1:** Higher the association of image of being environment friendly with the usage of Solar Glowsigns, higher is the likelihood of use of these products.

Lately many companies have been trying to project an image of being environment friendly by participating in projects such as "Green Delhi" drive (whereby plant guards on footpaths and road dividers have been painted green and a board carrying the name of the sponsors is displayed), by organising competitions based on this theme and by carrying out cleanliness drives. So it is proposed that usage of solar photovoltaic products may

also portray an image of being environment friendly and therefore higher the association (between usage and eco-friendly image) higher is the likelihood of use of solar photovoltaic products.

**Hypothesis OB2:** Companies whose business has some adverse impact on environment are more likely to opt for Solar Glowsigns as compared to those in other businesses.

Recently a trend has emerged where everybody is attempting to get onto the "green bandwagon". It is particularly more prominent in industries that have some adverse impact on the environment (such as automobiles, computer monitors, lubricants, etc.) because they tend to project their concern for environment. So it is proposed that such companies are more likely to opt for Solar Glowsigns as compared to others.

**Hypothesis OB3:** Companies in Fast Moving Consumer Goods (FMCG) and service sector are more likely to opt for Solar Glowsigns as compared to others.

Need for advertising and attracting customers' attention is much higher in case of FMCG and service industry as compared to other sectors.. Since using Solar Glowsigns for advertising is a new concept in India hence it has a potential of becoming an eye-catcher. Therefore it is proposed that companies in these sectors are more likely to use Solar Glowsigns.

**Hypothesis OB4:** MNCs are more likely to opt for Solar Glowsigns as compared to others.

A common allegation against MNCs, in India, is that they are here just to make money and they do not care about other social and environmental issues. It is proposed that MNCs may use these systems to portray their concern for environment and hence prevent such an impression from gaining ground.

**Hypothesis OB5:** Companies with higher advertisement or promotion budget have higher likelihood of opting for Solar Glowsigns.

Since initial cost of Solar Glowsigns is much higher than conventional glowsigns therefore using them for advertising would mean higher expense on this account. Hence it is felt that companies with higher advertising budgets will have higher likelihood of opting for them.

**Hypothesis OB6:** Higher the turnover, higher is the likelihood of opting for Solar Glowsigns.

Initial cost of SPV products is higher than comparable conventional products. As a consequence it appears that bigger companies will have higher likelihood of buying these products. In this case, total annual turnover of the company has been used as an indicator of its size.

## 3.3 Individual Buyers

**Hypothesis IB1:** Purchase intention will be stronger in cases where need for the product is already felt.

Classically product is treated as a bundle of attributes (including price) [Srinivasan, 1997]. The attributes are natural to attract those who are likely to benefit from them (in

terms of need fulfilment). Hence it is proposed that people, who have some need that can be addressed by these products, are more likely to buy them. This is also supported by Woods (1960), according to whom, normally individuals make brand and product change decisions on a rational basis using need, performance and value criteria.

**Hypothesis IB2:** Higher the association of image of being (a) technologically aware and (b) environment friendly, with the usage of SPV products, higher is the likelihood of purchase of these products.

Congruence between the symbolic image of a product and a consumer's self-image implies greater probability of positive evaluation, preference, or ownership of that product [Kassarjian, 1971]. Therefore it is proposed that higher the association of image of being (a) technologically aware and (b) environment friendly, with the usage of SPV products higher is the likelihood of purchase of these products.

**Hypothesis IB3:** Higher the degree of venturesomeness, higher is the purchase intention, in case of Solar Cap.

Kassarjian (1971), in his review paper on personality and consumer behaviour, has quoted the work of Kernan (1968), Koponen (1960), Claycamp (1965) and many others to bring out relationship between the two. In accordance with the existing literature it is proposed that higher the degree of venturesomeness, higher is the purchase intention, in case of Solar Cap. To obtain a measure of venturesomeness the respondents will be asked to rate themselves according to their tendency of being a trendsetter or that of being a slow changer or of being a no-changer.

**Hypothesis IB4:** People with technical educational background are more likely to buy SPV products as compared to others.

SPV technology, as applied to consumer products, is relatively new to India and people, in general, are not aware about this technology and working of SPV products. This has been indicated by numerous reports of system failures from all over India. The root cause of these failures is people's inability to maintain and operate these systems properly (inspite of giving instruction manual with the systems and training of users, wherever possible). This has lead to a general perception that SPV systems do not work and are not reliable. In such a situation it is felt that people with technical educational background will better understand the technology and hence will have more confidence in the system. As a result, it can be said that people with technical educational background are more likely to buy SPV products as compared to others.

**Hypothesis IB5:** Lesser the age, higher the intensity of purchase intention.

Younger people have lower dependence on a particular tool (i.e. product) to solve a given problem or address a particular need because of their lower experience with that tool. Discussing about various personality types with reference to new product adoption, Woods (1981) mentions that 'resistors' or 'laggards' tend to be older customers. Also, LaBay and Kinnear (1981) have found that early adopters of solar energy systems are young people. Therefore, it is proposed that age and willingness to adopt SPV products are negatively correlated.

**Hypothesis IB6:** Higher the purchasing power, higher is the likelihood of purchase of Solar Photovoltaic products.

SPV products are costlier than comparable conventional products, at least, in terms of initial purchase price. As a consequence it is natural that people with higher purchasing power have higher likelihood of buying them. In this case, total annual family income has been used as an approximate indicator of purchasing power of an individual. Also, LaBay and Kinnear (1981) have found that early adopters of solar energy systems are people with higher income.

# 4

# RESEARCH METHODOLOGY

## 4.1 Introduction

This chapter deals with evolution of the research objectives to explore the hypotheses and development of a research plan to address the outlined objectives.

## 4.2 Problem Definition

The concept of Solar Photovoltaic technology, as applied to consumer products, is relatively new to India. In order to explore the research issues, we must address the following questions:

1. Who are the potential customers and what is their demographic profile?
2. What kind of product do they want?
3. What is their buying behaviour?
4. How should they be targeted?

## 4.3 Research Objectives

For the present problem the research objective can be stated as follows:

1. To determine the level of awareness among people (organisations and individuals) regarding Solar Photovoltaic technology and related products.
2. To find out people's perception and attitude towards Solar Photovoltaic products.
3. To compare customers' existing needs and these products' potential of satisfying them.
4. To identify potential buyers and to determine their demographic profile.
5. To determine their buying motives.
6. To identify the initiators and decision makers?
7. To determine various criteria used by the customers to evaluate these products.

## 4.4 Research Plan

Of the various available approaches such as: Observation, Focus-groups, Survey, and Experiment [Kotler, 1994], survey method was chosen for carrying out this study. The study is descriptive in nature and has been conducted in two parts viz.: among individual buyers and among organisational buyers.

### 4.4.1 Data Source

The study involves primary data collection by way of conducting a field survey.

### 4.4.2 Research Instrument

Buying intentions, attitudes, etc. of the target customers were required with respect to:

a) SPV products, in general.

b) Specific SPV products: Solar Glowsigns, Solar Cap, Charger and Ventilator.

To achieve aforementioned objectives a questionnaire was designed (refer Appendix B, C and D). It mainly has close-ended questions. This has the advantage of being less time consuming, free from interviewer bias and lends itself easily to interpretation and coding. In case of multiple choice questions, the list of alternatives was discussed with colleagues and finalised so as to offer appropriate alternatives to almost all types of people. At the same time, care was taken not to constrain the respondents to choose one of the given alternatives, by incorporating choices such as 'Don't Know', 'Others', 'Not Applicable', etc., wherever required. Open ended questions were kept to a minimum (were used only to elicit additional product features that the respondents might want the product to have). Various scaled response questions were also incorporated in the questionnaire to collect image, attitudinal and purchase intention data. A separate questionnaire was designed for each of the products. However, all of them conform to a common basic structure.

The questionnaire basically consists of 2 parts. The first part begins with relatively general and easier to answer questions and then progresses towards more thought provoking questions. According to Tauber (1973), in case of new product, one should measure whether it fulfils unmet needs or not. Therefore to begin with, the questions endeavour to find out if there exists a need that may be met by these products. Later depending on the purchase intention, it will be assessed whether the products really

address the needs or not. For instance, in case of Solar Glowsigns it asks about the extent of usage of glowsigns and signboards for advertising and their perceived potential of attracting attention. In case of Charger and Ventilator, the questionnaire begins with questions on make and model of car, frequency of use, duration for which it is parked under the sun etc. For Solar Cap, there are questions which ascertain as to (1) whether people feel hot in the head while wearing a cap, (2) whether having a fan in the cap can solve this problem and (3) if Solar Cap is suitable for this purpose.

In case of individual buyers, the questionnaire then probes about the buying process and tries to identify the initiators and decision makers. Specially for Charger and Ventilator, to get a better insight into the buying motives for car accessories, a list of motives is given and the respondent is asked to rate each of them on a five point scale, where 1 represents 'least important' and 5 represents 'most important'. To understand the process of brand evaluation, various parameters are listed and the respondent is asked to rate each of them on a 4 point scale, where 1 represents 'least important' and 4 represents 'most important'. These types of questions have been intentionally excluded from questionnaires meant for organisational buyers because in this case buying behaviour is highly complex and often more than one person is involved in decision making process. Also buying motives and the level at which purchase decision is made may vary from case to case.

Next are the questions on awareness about that particular product and source of information about the same. According to Woods (1960), normally individuals make brand and product change decisions on a rational basis using need, performance and value criteria. Questions to find the existence of need for the product have already been included. Next, the questionnaire asks the respondent to rate various attributes associated

with the product (including price) on a five point Likert Scale which ranges from 'Major Advantage' to 'Major Disadvantage'. These responses are later given weights of 1 to 5 respectively. Again, a five point Likert Scale has been used to obtain data relating to association of image of being technically aware and environment friendly, with the use of Solar Photovoltaic products. A five point intention-to-buy scale [Kotler, 1994], has been used to determine the purchase intention. Next, the questionnaire asks the respondent to indicate his/her preferred point of purchase (only in case of individual buyers). This question has implications for setting up of distribution channels for these products. This is followed by a question to ascertain the level of confidence in capability of the product to function in winters/rainy season/cloudy days.

Second part of the questionnaire seeks to ascertain demographic characteristics of the respondents (in case of individual buyers) such as age, sex, education, occupation and income. In case of organisational buyers, questions are asked on the nature of business, turnover and ad budget.

Prior to going for full-fledged survey, the questionnaire has to be pretested. Pretesting is an activity related to development of questionnaire to be used in survey. The purpose of pretesting a questionnaire is to ascertain (1) whether or not the questions are unambiguous and (2) whether or not the questions flow smoothly and the question sequence is logical [Green & Tull, 1988]. A pretesting of 4-5 interviews was done for each product category and changes were made in the choices, wording of questions and addition/deletion of questions.

### 4.4.3 Sampling Plan

#### 4.4.3.1 Sampling Unit

a) Organisational Buyers: In case of Solar Glowsigns, companies that employ signboards and glowsigns for outdoor advertising were the sampling units.

b) Individual Buyers: For Solar Caps, students, sports enthusiasts and middle and high-income group people, in general were the sampling units. In case of Ventilator and Charger, all car owners represented the sampling units.

#### 4.4.3.2 Sample Size

The survey was conducted in Delhi. Sample size for Solar Glowsigns was kept at 25. For survey among individual buyers (for Solar Cap, Charger and Ventilator) sample size was taken as 100 for each. The size was kept small in view of time and resource constraint.

#### 4.4.3.3 Sampling Procedure

Nonprobability (convenience) sampling was employed because of low sampling cost and greater convenience, moreover, it is widely used in studies involving new products [Green & Tull, 1988].

### 4.4.4 Contact Method

a) Organisational Buyers: The study was carried out by means of arranged personal interviews. Companies were chosen, the concerned person[1] was contacted

[1] People looking after Corporate Communication and Advertising ( specially outdoor advertising) are the decision makers in most of the cases.

telephonically, was told about the study and its objectives and appointment was sought. The people who granted appointments were given product literature and were explained about the product. They were then interviewed with the help of questionnaire. Besides answers to these questions, the relevant answers/queries/doubts were also noted.

b) Individual Buyers: This phase of the study was conducted by carrying out intercept interviews at shopping malls, parking lots, sports complexes and college campuses. Respondents were shown photograph of the product, were explained about it and were interviewed as per the questionnaire.

# 5

# DATA ANALYSIS

## 5.1 Introduction

A number of hypotheses have been suggested in chapter 3. Some of these relate to organisational buyers and some to individual buyers. These hypotheses are reproduced below:

**For Individual Buyers**

**Hypothesis IB1:** Purchase intention will be stronger in cases where need for the product is already felt.

**Hypothesis IB2:** Higher the association of image of being (a) technologically aware and (b) environment friendly, with the usage of SPV products, higher is the likelihood of purchase of these products.

**Hypothesis IB3:** Higher the degree of venturesomeness, higher is the purchase intention, in case of Solar Cap.

**Hypothesis IB4:** People with technical educational background are more likely to buy SPV products as compared to others.

**Hypothesis IB5:** Lesser the age, higher the intensity of purchase intention.

**Hypothesis IB6:** Higher the purchasing power, higher is the likelihood of purchase of Solar Photovoltaic products.

**For Organisational Buyers**

**Hypothesis OB1:** Higher the association of image of being environment friendly with the usage of Solar Glowsigns, higher is the likelihood of use of these products.

**Hypothesis OB2:** Companies whose business has some adverse impact on environment are more likely to opt for Solar Glowsigns as compared to those in other businesses.

**Hypothesis OB3:** Companies in Fast Moving Consumer Goods (FMCG) and service sector are more likely to opt for Solar Glowsigns as compared to others.

**Hypothesis OB4:** MNCs are more likely to opt for Solar Glowsigns as compared to others.

**Hypothesis OB5:** Companies with higher advertisement or promotion budget have higher likelihood of opting for Solar Glowsigns.

**Hypothesis OB6:** Higher the turnover, higher is the likelihood of opting for Solar Glowsigns.

On the basis of data collected through sample survey, the above hypotheses have been tested. This chapter deals with hypotheses testing and other data analysis. Various

statistical techniques such as Chi-square Test, Fisher Test, Spearman Rank Correlation, etc. have been used for this testing. These results are now presented below.

## 5.2 Individual Buyers

Buying intentions and other aspects of individual buyers have been assessed with respect to Solar Cap, Charger and Ventilator. These data will now be presented in summary form and then used for testing of relevant hypotheses.

### 5.2.1 Sample Characteristics

The sample of 100 individuals for Solar Cap, Charger and Ventilator varied in age from less than 20 years to above 50 years but was largely in 21-25 year age group. Many of these were professionally qualified though most of them were just graduates. The sample consisted of a variety of people varying from students to executive/managers to businessmen. For Solar Cap, most of the respondents were either students or businessmen and for Charger and Ventilator most of the respondents were either executives/managers or businessmen. Annual family income of the respondents varied from below Rs. 1 lakh to above Rs. 10 lakh, though majority of them were in the Rs. 1 lakh - 3 lakh bracket (refer Appendix E).

### 5.2.2 Awareness of SPV Products

Table 5.1 presents the figures for awareness level of respondents with respect to various SPV products.

**Table 5.1 : Distribution by Level of Awareness**

| Level of Awareness | Solar Cap | Charger | Ventilator |
|---|---|---|---|
| Absolutely new to me | 90 | 89 | 91 |
| Had faint idea about it | 9 | 10 | 8 |
| Very familiar to me | 1 | 1 | 1 |

Table 5.2 gives the sources from where the respondents got information about these products.

**Table 5.2 : Distribution by Source of Information**

| Source of Information | Solar Cap | Charger | Ventilator |
|---|---|---|---|
| TV / Radio | 1 | 1 | 0 |
| Newspapers / Magazines | 4 | 1 | 1 |
| Exhibition | 3 | 5 | 5 |
| Friends / Relatives | 2 | 4 | 3 |
| Not Applicable | 90 | 89 | 91 |

**Interpretation:** The above data shows that for an overwhelming majority of the sample these products are absolutely new. Source of information for Charger and Ventilator were exhibitions and friends/relatives and respondents got information about Solar Cap from newspapers/magazines and exhibitions. This data indicate that a prerequisite for marketing these products is an information dissemination campaign whereby the target customers are made aware of these products, their features and uses.

### 5.2.3 Hypotheses Testing

#### 5.2.3.1 Hypothesis IB1

Hypothesis IB1 states that purchase intention will be stronger in cases where need for the product is already felt. Some proxy variables will be used here to measure the intensity of need. In case of Solar Cap answers to questions 5 (refer Appendix C) provide a measure of need for this product. For Charger, question 3 (refer Appendix D), about the frequency of car use, reflects need intensity because batteries in cars, which are not used daily, normally run down and such cars often have starting trouble. For Ventilator, questions 4 (whether the car is ac or not) and 5 (duration of parking under Sun) (refer Appendix D) provide a good measure of need intensity. Moreover, people whose cars are parked under Sun for long hours are more likely to benefit from this product because while the car is parked under the Sun, temperature in the car rises drastically and in such situations Ventilator turns out to be very useful.

**For Solar Cap**

$H_0$ : There is no difference in purchase intention of those who sweat and feel hot in the head while wearing a cap and those who do not.

$H_1$ : The two groups differ in their purchase intention.

For ease of testing and interpretation, respondents have been divided into 2 groups, those having positive purchase intention (ones who opted for 'will definitely buy' and 'will probably buy') and those who do not. Similarly, all the respondents have been grouped in

2 categories, those who sweat and feel hot in the head while wearing a cap and those who do not. Table 5.3 gives the distribution according to this categorisation.

**Table 5.3 : Contingency Table for Feeling While Wearing a Cap v/s Purchase Intention**

| | Sweat and feel hot | Others | Total |
|---|---|---|---|
| **Positive Purchase Intention** | 35 (62.5 %) | 17 (38.6 %) | 52 |
| **Others** | 21 (37.5 %) | 27 (61.4 %) | 48 |
| **Total** | 56 (100 %) | 44 (100 %) | 100 |

df = 1 $\chi^2$ (with continuity correction) = 4.706 Actual significance level = 0.03

Phi Coefficient, $\phi = 0.237$

Hence, at $\alpha = 0.05$, $H_0$ is rejected and $H_1$ is accepted i.e. those who sweat and feel hot in the head while wearing a cap are more likely to buy Solar Cap than those who do not. Here $\phi$ is a measure of the extent of association between the 2 variables, [Siegel, 1988].

**For Charger**

$H_0$ : There is no association between degree of car usage (question 3) and purchase intention.

$H_1$ : Degree of car usage and purchase intention are negatively correlated.

Spearman rank-order correlation coefficient ($r_s$) = -0.201

Actual one-tailed significance = 0.022

Hence, at $\alpha = 0.05$, $H_0$ is rejected and $H_1$ is accepted i.e. higher the car use, lower is the likelihood of purchase of Charger.

**Interpretation:** People who take out their cars occasionally or only on weekends are likely to be the potential customers for Charger.

**For Ventilator**

Measure 1:

$H_0$ : There is no difference in purchase intention of those who have air-conditioned cars and those who do not have ac cars.

$H_1$ : The two groups differ in their purchase intention.

Table 5.4 gives the distribution according to this categorisation.

**Table 5.4 : Contingency Table for AC/ Non-AC Car v/s Purchase Intention**

| | AC Car | Non-AC Car | Total |
|---|---|---|---|
| **Positive Purchase Intention** | 17 (50 %) | 50 (75.8 %) | 67 |
| **Others** | 17 (50 %) | 16 (24.2 %) | 33 |
| **Total** | 34 (100 %) | 66 (100 %) | 100 |

df = 1 $\chi^2$ (with continuity correction) = 5.619 Actual significance level = 0.0178

Phi Coefficient, $\phi = -0.259$

Hence, at $\alpha = 0.05$, $H_0$ is rejected and $H_1$ is accepted i.e. those having non-ac cars are more likely to buy Ventilator as compared to those who have ac cars.

Measure 2:

$H_0$ : There is no association between duration for which the car is parked under the Sun and purchase intention.

$H_1$ : Duration for which the car is parked under the Sun and purchase intention are positively correlated.

Spearman rank-order correlation coefficient ($r_s$) = 0.2252

Actual one-tailed significance = 0.012

Hence, at $\alpha = 0.05$, $H_0$ is rejected and $H_1$ is accepted i.e. longer the car is parked under the Sun, higher is the likelihood of purchase of Ventilator.

**Interpretation:** During summers when the car is parked under sun it becomes "as hot as an oven". So people who have to park their cars under Sun for long hours (due to lack of shaded parking space or due to nature of work) or do not have AC in their cars to take care of the high temperature inside the car are likely to purchase Ventilator.

### 5.2.3.2 Hypothesis IB2

Hypothesis IB2A

$H_0$ : Degree of association of image of being technologically aware, with the usage of SPV products and purchase intention are unrelated.

$H_1$ : Degree of association of image of being technologically aware, with the usage of SPV products and purchase intention are positively correlated.

**Table 5.5 : Spearman Rank Correlation Between Association of Image of being Technologically Aware and Purchase Intention**

| Product | $r_s$ | Actual 1-Tailed Significance | $H_0$ | $H_1$ |
|---|---|---|---|---|
| Solar Cap | 0.3903 | 0.000 | Rejected | Accepted |
| Charger | 0.0162 | 0.436 | Accepted | |
| Ventilator | 0.1414 | 0.080 | Accepted | |

Table 5.5 shows that at $\alpha = 0.05$, $H_0$ is rejected for Solar Cap and $H_1$ is accepted i.e. people who associate an image of being technologically aware, with the usage of SC, are more likely to purchase it. Value of $r_s$ indicates that this association is of moderate strength. However, for Charger and Ventilator, at $\alpha = 0.05$, $H_0$ is accepted i.e. the image factor and purchase intention are independent.

Hypothesis IB2B

$H_0$ : Degree of association of image of being environment friendly, with the usage of SPV products and purchase intention are unrelated.

$H_1$ : Degree of association of image of being environment friendly, with the usage of SPV products and purchase intention are positively correlated.

**Table 5.6 : Spearman Rank Correlation Between Association of Image of being Environment Friendly and Purchase Intention**

| Product | $r_s$ | Actual 1-Tailed Significance | $H_0$ | $H_1$ |
|---|---|---|---|---|
| Solar Cap | 0.3851 | 0.000 | Rejected | Accepted |
| Charger | -0.0469 | 0.322 | Accepted | |
| Ventilator | 0.0147 | 0.442 | Accepted | |

Table 5.6 shows that at $\alpha = 0.05$, $H_0$ is rejected for Solar Cap and $H_1$ is accepted i.e. people who associate an image of being environment friendly, with the usage of SC, are more likely to purchase it. Value of $r_s$ indicates that this association is of moderate strength. However, for Charger and Ventilator, at $\alpha = 0.05$, $H_0$ is accepted i.e. the image factor and purchase intention are independent.

**Interpretation:** The results indicate that people evaluate Charger and Ventilator purely on the basis of their functional value (evident from results of testing hypothesis IB1) rather than their potential of portraying an image of being technologically aware and environment friendly. However, on the other hand it is apparent that apart from functional value people also associate some image building potential (indicated by a moderate value of $r_s$) with the use of Solar Cap. These findings are relevant in designing the advertisement campaign for these products.

### 5.2.3.3 Hypothesis IB3

According to Hypothesis IB3 higher the degree of venturesomeness, higher is the purchase intention for Solar Cap. Here question 7 (refer Appendix C) provides a good measure of venturesomeness.

$H_0$ : There is no association between degree of venturesomeness and purchase intention.

$H_1$ : Degree of venturesomeness and purchase intention are positively correlated.

Spearman rank-order correlation coefficient ($r_s$) = 0.2305

Actual one-tailed significance = 0.011

Hence, at $\alpha = 0.05$, $H_0$ is rejected and $H_1$ is accepted i.e. more venturesome people are more likely to purchase Solar Cap.

**Interpretation:** Solar Cap has unconventional looks and hence calls for a bold, enterprising and outgoing personality for adoption. This implies that fashion conscious people who keep up with the changes in fashions and trends are more likely to buy it.

### 5.2.3.4 Hypothesis IB4

$H_0$ : There is no difference in purchase intention of those who have technical educational background and those who do not have.

$H_1$ : The two groups differ in their purchase intention.

Table 5.7, 5.8 and 5.9 give the distribution according to this categorisation of technically educated v/s others for Solar Cap, Charger and Ventilator respectively.

**Table 5.7 : Contingency Table for Educational Qualification v/s Purchase Intention for Solar Cap**

| | Technically Educated | Others | Total |
|---|---|---|---|
| **Positive Purchase Intention** | 16 (84.2 %) | 36 (44.4 %) | 52 |
| **Others** | 3 (15.8 %) | 45 (55.6 %) | 48 |
| **Total** | 19 (100 %) | 81 (100 %) | 100 |

df = 1 $\chi^2$ (with continuity correction) = 8.222 Actual significance level = 0.0041

Phi Coefficient, $\phi = 0.312$

Hence, at $\alpha = 0.05$, $H_0$ is rejected and $H_1$ is accepted i.e. technically educated people are more likely to buy SC as compared to others. The value of phi coefficient indicates moderate association between these 2 variables.

**Table 5.8 : Contingency Table for Educational Qualification v/s Purchase Intention for Charger**

| | Technically Educated | Others | Total |
|---|---|---|---|
| **Positive Purchase Intention** | 8 (72.7 %) | 37 (41.6 %) | 45 |
| **Others** | 3 (27.3 %) | 52 (58.4 %) | 55 |
| **Total** | 11 (100 %) | 89 (100 %) | 100 |

df = 1 $\chi^2$ (with continuity correction) = 2.684 Actual significance level = 0.1014

Phi Coefficient, $\phi = 0.196$

Hence, at $\alpha = 0.05$, $H_0$ is accepted i.e. educational background and purchase intention are independent.

**Table 5.9 : Contingency Table for Educational Qualification v/s Purchase Intention for Ventilator**

| | Technically Educated | Others | Total |
|---|---|---|---|
| **Positive Purchase Intention** | 10 (90.9 %) | 57 (64 %) | 67 |
| **Others** | 1 (9.1 %) | 32 (36 %) | 33 |
| **Total** | 11 (100 %) | 89 (100 %) | 100 |

df = 1 $\chi^2$ (with continuity correction) = 2.096 Actual significance level = 0.1477

Phi Coefficient, $\phi = 0.179$

Hence, at $\alpha = 0.05$, $H_0$ is accepted i.e. educational background and purchase intention are independent.

### 5.2.3.5 Hypothesis IB5

$H_0$ : There is no association between age and purchase intention.

$H_1$ : Age and purchase intention are negatively correlated.

**Table 5.10 : Spearman Rank Correlation Between Age and Purchase Intention**

| Product | $r_s$ | Actual 1-Tailed Significance | $H_0$ |
|---|---|---|---|
| Solar Cap | -0.0856 | 0.199 | Accepted |
| Charger | -0.0425 | 0.337 | Accepted |
| Ventilator | -0.0784 | 0.219 | Accepted |

Table 5.10 shows that at $\alpha = 0.05$, $H_0$ is accepted for all the products i.e. age and purchase intention are independent.

### 5.2.3.6 Hypothesis IB6

$H_0$ : There is no association between purchasing power and purchase intention.

$H_1$ : Purchasing power and purchase intention are positively correlated.

**Table 5.11 : Spearman Rank Correlation Between Purchasing Power and Purchase Intention**

| Product | $r_s$ | Actual 1-Tailed Significance | $H_0$ | $H_1$ |
|---|---|---|---|---|
| Solar Cap | 0.1726 | 0.043 | Rejected | Accepted |
| Charger | 0.1194 | 0.118 | Accepted | |
| Ventilator | -0.0188 | 0.426 | Accepted | |

Table 5.11 shows that at $\alpha = 0.05$, $H_0$ is rejected for Solar Cap and $H_1$ is accepted i.e. higher the purchasing power, higher is the likelihood of its purchase. However, for

Charger and Ventilator, at $\alpha = 0.05$, $H_0$ is accepted i.e. the purchasing power and purchase intention are independent.

**Interpretation:** The price of Solar Cap is on the higher side (in the range of Rs. 500-600) as compared to ordinary caps and hence we have obtained a dependence between purchasing power and purchase intention. This means that the target segment for Solar Cap is the higher income group of the society. Results for other two products indicate that there is no dependence between purchasing power and purchase intention.

## 5.2.4 Perception and Attitude

### 5.2.4.1 Attribute Rating

Table 5.12, 5.13 and 5.14 give average rating of various attributes associated with Solar Cap, Charger and Ventilator respectively. The respondents were asked to rate each of the attributes on a 5 point Likert scale which ranges from 'Major Advantage' to 'Major Disadvantage' (refer Appendix C and D). These responses were later given weights of 1 to 5 respectively.

**Table 5.12 : Attribute Ratings for Solar Cap**

| Attribute | Average Rating |
|---|---|
| 1. Adds to the comfort by providing ventilation & air circulation | 1.76 |
| 2. Eye-catcher | 2.82 |
| 3. Trendy | 2.55 |
| 4. No running cost | 1.93 |
| 5. Price | 3.40 |

**Interpretation:** High average rating of 3.4 for price indicates that it is felt that the price is high. Moreover, it was observed that there was no dependence between respondents' rating of price and their income ($r_s$ = -0.088, actual $\alpha$ = 0.192), thereby indicating that price was perceived as high by people in all income groups. It was also found that rating of price and purchase intention are strongly negatively correlated ($r_s$ = -0.5556, actual $\alpha$ = 0.000), i.e. higher the rating of price lower is the purchase intention. This implies that price may prove to be a deterrent in the success of this product.

The main attribute of Solar Cap i.e. 'adds to the comfort by providing ventilation & air circulation' receives the lowest rating of 1.76 among all the attribute, indicating that respondents consider this a major attraction of this product. Additionally rating of this attribute and purchase intention are negatively correlated, i.e. the lower the rating of this attribute higher is the likelihood of purchase ($r_s$ = -0.2945, actual $\alpha$ = 0.001).

**Table 5.13 : Attribute Ratings for Charger**

| Attribute | Average Rating |
|---|---|
| 1. Gives freedom from starting trouble | 1.72 |
| 2. Maintenance free | 1.68 |
| 3. Extends battery life | 1.69 |
| 4. No running cost | 1.69 |
| 5. Price | 2.90 |

Table 5.14 : Attribute Ratings for Ventilator

| Attribute | Average Rating |
|---|---|
| 1. Provides comfort by reducing temperature inside the car | 1.39 |
| 2. Maintenance free | 1.52 |
| 3. Independence from battery for operation | 1.53 |
| 4. Trendy | 2.57 |
| 5. No running cost | 1.52 |
| 6. Price | 2.83 |

**Interpretation:** Attributes 1 and 3 for Charger and Ventilator have received very low ratings indicating that respondents realise these products' functional value. Also price has not been rated very high thereby indicating that the respondents do not perceive these products to be very highly priced.

### 5.2.4.2 Perception of Performance Under Adverse Conditions

Question 18, in case of Charger and Ventilator (refer Appendix D), gives an idea of respondent's belief about performance of these products in winters/rainy season/cloudy days. This question takes care of both, the respondent's apriori knowledge (based on feedback from users or as a result of understanding of this technology) as well as his preconceived notions about functionality of SPV products. Table 5.15 presents the responses to this question.

**Table 5.15 : Perception Regarding Functionality of Charger & Ventilator**

| Perception | No. of Respondents |
|---|---|
| would function | 37 |
| may/may not function | 35 |
| would not function | 12 |
| don't know | 16 |

**Interpretation:** The above table shows that 63% of the respondents are not sure of the system's ability to perform properly in the absence of sunlight. The reasons of this perception are many. Firstly, there have many reports of failure of SPV systems specially in rural areas. Though the main reason for these failures has been lack of maintenance of batteries and lack of availability of spare parts in the rural areas but a general impression has gained ground that SPV systems are not reliable and do not work properly. Secondly, many people do not understand the technology underlying the operation of these products and hence there is a lack of confidence in the system's capability.

## 5.2.5 Buying Behaviour

### 5.2.5.1 Initiators and Deciders

Table 5.16 and 5.17 present data regarding who initiates and decides to buy cap and car accessories.

**Table 5.16 : Initiators in the buying process**

| Initiator | Cap | Car Accessories |
|---|---|---|
| Self | 72 | 68 |
| Spouse | 0 | 14 |
| Children | 1 | 3 |
| Parents | 3 | 15 |
| Friends / Relatives | 23 | 0 |
| Others | 1 | 0 |

**Table 5.17 : Deciders in the buying process**

| Decider | Cap | Car Accessories |
|---|---|---|
| Self | 72 | 70 |
| Spouse | 1 | 2 |
| Children | 1 | 1 |
| Parents | 11 | 26 |
| Friends / Relatives | 15 | 0 |
| Others | 0 | 1 |

**Interpretation:** The above tables indicate that in case of caps mostly it is the individual or at best friends/relatives who are involved in the buying process. A figure of 11 for parents as deciders indicates that in cases where the respondents have not attained financial independence, parents have a say in such purchase decisions. In the case of car accessories, apart from the individual himself, spouse and parents are also involved in the

buying process. A relatively high figure for parents as deciders is again due to financial dependence of the respondent.

### 5.2.5.2 Buying Motives

This section presents the findings on buying motives for car accessories, it is assumed that the results can be directly applied to Charger and Ventilator. Table 5.18 gives average ratings of various possible buying motives. Respondents were asked to rate each of the motives on a 5 point scale, where 1 represents 'least important' and 5 represents 'most important' (refer Appendix D).

**Table 5.18 : Average Rating of Buying Motives**

| Buying Motive | Average Rating |
|---|---|
| Luxury / Comfort | 3.14 |
| Enhances prestige / image | 3.17 |
| Provides real value for money | 4.25 |
| It is fashionable / trendy | 2.86 |
| Functional value | 4.33 |
| Aesthetics | 3.52 |

**Interpretation:** The above table indicates that people give highest importance to 'value for money' and 'functional value' and give medium importance to 'fashion/trend', while buying a car accessory. This reinforces the finding (refer sections 5.2.3.2, 5.2.3.5, 5.2.3.6 and 5.2.4.1) that for Charger and Ventilator the most important factor in making a

purchase decision is the perceived functional value which in turn translates to need for the product (as determined by car usage pattern).

### 5.2.5.3 Brand Selection

Table 5.19 gives average ratings of parameters on which the customers evaluate various brands of car accessories. Respondents were asked to rate each of the parameters on a 4 point scale, where 1 represents 'least important' and 4 represents 'most important' (refer Appendix D).

**Table 5.19 : Average Rating of Parameters for Brand Selection**

| Parameter | Average Rating |
|---|---|
| Durability | 3.11 |
| Guaranty / warranty | 2.69 |
| Performance | 3.17 |
| Reparability | 2.75 |
| Cost | 3.24 |
| Brand Name | 2.60 |

**Interpretation:** The above table indicates that people consider cost, performance and durability as very important factors while choosing among brands of car accessories while relatively lower importance is given to brand name, guaranty / warranty and reparability. This knowledge of customer's evaluation system will help in providing the direction for product improvement efforts and increase the chances of the product becoming a success.

### 5.2.5.4 Point of Purchase

Questionnaire probes the respondents on their preferred point of purchase for various SPV products (refer Appendix C and D). Answer to this question has implications for setting up of distribution channels for various products. Table 5.20 presents the answer to this question.

**Table 5.20 : Distribution by Preferred Point of Purchase**

| Point of purchase | Solar Cap | Charger & Ventilator |
|---|---|---|
| Sportsgear Shop | 31 | NA |
| Car Accessory Shop | NA | 61 |
| Departmental Store | 13 | 6 |
| Garments Shop | 3 | NA |
| Shop exclusively for solar products | 27 | 24 |
| Through Teleshopping | 1 | 1 |
| Through home visit of salesman | 5 | 5 |
| Not Applicable | 20 | 3 |

**Interpretation:** The above data indicates that the most preferred point of purchase for Solar Cap is sports shop and that for Charger and Ventilator is car accessory shop. Reason for choosing car accessory shop as the outlet indicates that respondents do not consider these products (Charger and Ventilator) much different from other car accessories. About 25% of the respondents have also expressed preference for an exclusive shop for solar products.

## 5.3 Organisational Buyers

### 5.3.1 Sample Characteristics

The sample of 25 companies for Solar Glowsigns varied in annual turnover from Rs. 50-100 cr. to more than Rs. 500 cr. Their annual advertisement budget varied from Rs. 10-25 lakh to more than Rs. 50 cr. Table 5.21 and 5.22 present the sample characteristics in terms of annual turnover and annual advertisement budget.

**Table 5.21 : Distribution By Annual Turnover**

| Turnover (in Rs.) | No. of Companies |
|---|---|
| 50 - 100 cr. | 2 |
| 100 - 250 cr. | 7 |
| 250 - 500 cr. | 3 |
| > 500 cr. | 13 |

**Table 5.22 : Distribution By Annual Advertisement Budget**

| Advertisement Budget (in Rs.) | No. of Companies |
|---|---|
| 10 - 25 lakh | 1 |
| 25 - 50 lakh | 0 |
| 50 - 100 lakh | 1 |
| 1 - 5 cr. | 4 |
| 5 - 10 cr. | 7 |
| 10 - 25 cr. | 5 |
| 25 - 50 cr. | 3 |

| Advertisement Budget (in Rs.) | No. of Companies |
|---|---|
| > 50 cr. | 4 |

## 5.3.2 Awareness of SPV Products

Table 5.23 presents the figures for respondents' level of awareness (refer question 3, Appendix B) about Solar Glowsign.

**Table 5.23 : Distribution by Level of Awareness**

| Level of Awareness | No. of Companies |
|---|---|
| Absolutely new to me | 4 |
| Had faint idea about it | 10 |
| Very familiar to me | 11 |

Table 5.24 gives the sources from where the respondents got information about Solar Glowsign.

**Table 5.24 : Distribution by Source of Information**

| Source of Information | No. of Companies |
|---|---|
| Newspapers / Magazines | 1 |
| Manufacturer of Solar Glowsigns | 9 |
| Actual Product | 9 |
| Advertisement Agency | 1 |
| Others (Own Idea) | 1 |

**Interpretation:** Table 5.23 indicates that Solar Glowsign was an absolutely new product only for 16% of the respondents and rest of them had atleast a faint idea about the product. This is due to the fact that one company has already put up this type of glowsigns in the city. It indicates that this development has caught the attention of people dealing in outdoor advertising.

## 5.3.3 Hypotheses Testing

### 5.3.3.1 Hypothesis OB1

In question 6 (refer Appendix B), the organisational respondents were asked whether use of Solar Glowsigns portrays an image of being environment friendly. Their response and their purchase intention are related through the following hypothesis:

$H_0$ : Degree of association of image of being environment friendly, with the usage of Solar Glowsign and purchase intention are unrelated.

$H_1$ : Degree of association of image of being environment friendly, with the usage of Solar Glowsign and purchase intention are positively correlated.

Spearman rank-order correlation coefficient ($r_s$) = 0.5087

Actual one-tailed significance = 0.005

Hence, at $\alpha = 0.05$, $H_0$ is rejected and $H_1$ is accepted. The value of $r_s$ indicates that there is a fairly strong positive correlation between image factor and purchase intention.

**Interpretation:** The above results indicate that companies have dual objective in using Solar Glowsigns. Their aim is to use Solar Glowsigns both for advertising their product and for portraying an image of being eco-friendly.

### 5.3.3.2 Hypothesis OB2

Hypothesis OB2 states that companies whose business has some adverse impact on environment are more likely to opt for Solar Glowsigns as compared to those in other businesses. To facilitate hypothesis testing, the companies (covered by the survey) have been divided into 2 groups, those having positive purchase intention (ones who marked 'will definitely opt for' and 'will probably opt for') and those who do not. Also the companies have been divided into 2 categories viz. polluting and non-polluting. Companies in the business of paints, auto manufacturing, tobacco, batteries, tyres, generators and lubricants have been put in the former category and companies in information technology sector, banks, telecom companies, biscuits, white goods and newspaper have been classified into the latter group.

$H_0$ : There is no difference in purchase intention of 'polluting' and 'non-polluting' companies.

$H_1$ : Polluting companies are more likely to purchase Solar Glowsigns as compared to non-polluting companies.

Table 5.25 gives the distribution according to this categorisation.

**Table 5.25 : Contingency Table for Nature of Company v/s Purchase Intention**

| | Polluting | Non-polluting | Total |
|---|---|---|---|
| **Positive Purchase Intention** | 7 (58.3 %) | 10 (76.9 %) | 17 |
| **Others** | 5 (41.7 %) | 3 (23.1 %) | 8 |
| **Total** | 12 (100 %) | 13 (100 %) | 25 |

Since the sample size is small, Fisher exact test[1] is most appropriate in this case, [Siegel, 1988]. The observed p (one-tailed) = 0.286.

Here p is the probability of observing a set of cell frequencies as extreme or more than the one actually observed, when $H_0$ is true. Since observed $p > 0.05$ hence $H_0$ is accepted, i.e. there is no difference in purchase intention of 'polluting' and 'non-polluting' companies.

**Interpretation:** The results indicate that propensity to portray an image of being eco-friendly has no bearing on the nature of business of the company. This implies that impact of a company's business on environment should not be a criterion for segmentation.

[1] In case of a 2X2 contingency table of the following form:

| Variable | Group I | Group II | Total |
|---|---|---|---|
| + | A | B | A+B |
| - | C | D | C+D |
| Total | A+C | B+D | N |

The probability of observing a set of cell frequencies as extreme or more extreme than the one actually observed, when $H_0$ is true, is given as :

$$p = \frac{(A+B)!(C+D)!(A+C)!(B+D)!}{N!A!B!C!D!}$$

for each possible table.

### 5.3.3.3 Hypothesis OB3

Hypothesis OB3 states that companies in Fast Moving Consumer Goods (FMCG) and service sector are more likely to opt for Solar Glowsigns as compared to others. For testing this hypothesis the sample companies have been divided in 2 categories: I and II. Category I included companies in Fast Moving Consumer Goods (FMCG) sector: biscuits, beverages, cigarettes and service industry: banks, cellular phone service providers, hotels, airlines, courier service. All other companies have been put in category II.

$H_0$ : There is no difference in purchase intention of category I and category II companies.

$H_1$ : Category I companies are more likely to purchase Solar Glowsigns as compared to category II companies.

Table 5.26 gives the distribution according to this categorisation.

**Table 5.26 : Contingency Table for Type of Sector v/s Purchase Intention**

| | Category I | Category II | Total |
|---|---|---|---|
| **Positive Purchase Intention** | 9 (81.8 %) | 8 (57.1 %) | 17 |
| **Others** | 2 (18.2 %) | 6 (42.9 %) | 8 |
| **Total** | 11 (100 %) | 14 (100 %) | 25 |

Observed p (one-tailed) = 0.1904

Since observed $p > 0.05$, hence $H_0$ is accepted, i.e. purchase intention is independent of the type of sector to which a company belongs.

**Interpretation:** Size is a major limitation in case of Solar Glowsigns because cost increases steeply with increase in size. Companies in FMCG and service sector prefer to use very large signboards or glowsigns because their prime consideration in using these aids is to have high visibility. Therefore, as far as potential of attracting attention is concerned, increased expenditure (solar glowsigns cost much higher as compared to ordinary glowsigns) does not justify a switch from ordinary glowsigns, signboards and hoardings to Solar Glowsigns. As a result it may be inferred that purchase intention for Solar Glowsigns is independent of extent of advertiser's need to attract attention.

### 5.3.3.4 Hypothesis OB4

$H_0$ : There is no difference in purchase intention of MNCs and Indian companies.

$H_1$ : MNCs are more likely to purchase Solar Glowsigns as compared to Indian companies.

Table 5.27 gives the distribution according to this categorisation.

**Table 5.27 : Contingency Table for Ownership of Company v/s Purchase Intention**

| | Category I | Category II | Total |
|---|---|---|---|
| **Positive Purchase Intention** | 9 (69.2 %) | 8 (66.7 %) | 17 |
| **Others** | 4 (30.8 %) | 4 (33.3 %) | 8 |
| **Total** | 13 (100 %) | 12 (100 %) | 25 |

Observed p (one-tailed) = 0.6133

Since observed $p > 0.05$, hence $H_0$ is accepted, i.e. purchase intention is independent of the fact whether the company is an MNC or not.

### 5.3.3.5 Hypothesis OB5

$H_0$ : There is no association between advertisement budget and purchase intention.

$H_1$ : Advertisement budget and purchase intention for Solar Glowsigns are positively correlated.

Spearman rank-order correlation coefficient ($r_s$) = -0.0179

Actual one-tailed significance = 0.466

Hence, at $\alpha = 0.05$, $H_0$ is accepted, i.e. advertisement budget and purchase intention are independent.

**Interpretation:** We are getting negative correlation (statistically insignificant) between advertisement budget and purchase intention as opposed to hypothesised positive correlation. This result can be explained by the fact that there was express reluctance on part of the respondents to disclose their advertisement budget (it was told that this is 'confidential'). So there is a possibility of biased (on the lower side) responses. Moreover, this is not a published information and hence could not be verified from secondary sources.

### 5.3.3.6 Hypothesis OB6

$H_0$ : There is no association between turnover and purchase intention.

$H_1$ : Turnover and purchase intention for Solar Glowsign are positively correlated.

Spearman rank-order correlation coefficient ($r_s$) = -0.0921

Actual one-tailed significance = 0.331

Hence, at $\alpha = 0.05$, $H_0$ is accepted, i.e. there is no associate between a company's purchase intention for Solar Glowsigns and its turnover.

**Interpretation:** The unexpected results may also be due to the fact the sample had higher turnover skew. The reason for this skew is that the concerned persons in smaller companies generally did not co-operate in the study.

## 5.3.4 Perception and Attitude

### 5.3.4.1 Attribute Rating

Table 5.28 gives average rating of various attributes associated with Solar Glowsigns. The respondents were asked to rate each of the attributes on a 5 point Likert scale which ranges from 'Major Advantage' to 'Major Disadvantage' (refer Appendix B). These responses were later given weights of 1 to 5 respectively.

**Table 5.28 : Attribute Ratings for Solar Glowsigns**

| Attribute | Average Rating |
|---|---|
| No problems of State Electricity Boards' restrictions on lighting for ads during peak hours | 1.52 |
| Automatic on/off depending on light conditions | 1.72 |
| Novelty appeal | 2.08 |
| Eye-catcher | 2.00 |
| No cabling / minimal cabling | 2.28 |
| Price | 4.24 |

**Interpretation:** The 'elimination of problems of State Electricity Boards' (SEB) restrictions on lighting for ads during peak hours' is a major attraction of Solar Glowsigns (this attribute has received the lowest average rating of 1.52). This implies that areas where SEBs enforce these restrictions strictly are potential markets and this should be a major criterion for market segmentation. Also the feature of 'automatic on/off ' has been rated high as an advantage. This feature results in power saving because Solar Glowsign switches off automatically at a pre-set time. So instead of leaving the glowsign on for the entire night it could be set to switch off at a time when the outdoor movement becomes low. Though 'eye-catcher' and 'novelty appeal' have also been rated as advantages but marketing strategy should not lay much emphasis on these because "they are short-lived" and will become inconsequential once the product catches on.

An average rating of 4.24 for price indicates that respondents feel that the price is a major negative point about Solar Glowsigns. For many of the companies high price was the only reason for their reluctance to buy Solar Glowsigns.

### 5.3.4.2 Perception of Performance Under Adverse Conditions

Question 8 (refer Appendix B) gives an idea of respondent's belief about performance Solar Glowsigns in winters/rainy season/cloudy days. This question takes care of both, the respondent's apriori knowledge (based on observation, feedback from users or as a result of understanding of this technology) as well as his preconceived notions about functionality of SPV products. Table 5.29 presents the responses to this question.

**Table 5.29 : Perception Regarding Functionality of Solar Glowsigns**

| Perception | No. of Respondents |
|---|---|
| would function | 3 |
| may/may not function | 15 |
| would not function | 3 |
| don't know | 4 |

**Interpretation:** The above table shows that 88% of the respondents are not sure of the system's ability to perform properly in the absence of sunlight. The main reason for this is the occasional failure of some of the Solar Glowsigns presently installed in Delhi. This is complemented by reports of failure of SPV systems, specially in rural areas. Though the main reason for these failures has been lack of maintenance of batteries and lack of availability of spare parts in the rural areas but a general impression has gained ground that SPV systems are not reliable and do not work properly. This implies that to make this product a success demonstration units should be set up so that people develop confidence in the system's performance.

### 5.3.5 Apprehensions About Solar Glowsigns

During discussions, respondents expressed the following apprehensions about Solar Glowsigns:

1. They are not suited for sites which do not receive direct sunlight.
2. They are not suited for high luminosity requirements.
3. Systems installed at sites exposed to heavy vehicular pollution will require frequent cleaning of modules because of deposition on the module surface.
4. The system is open to vandalism/theft.
5. Need is felt for effective After Sales Service & maintenance arrangement.

# 6

# CONCLUSIONS

## 6.1 Results

This section summarises the results of hypotheses testing and analysis of other data collected through the questionnaires.

### 6.1.1 Awareness and Belief

It was found that awareness among individuals about SPV products (i.e. Cap, Charger and Ventilator) was very low and a majority of them were not sure of the system's ability to perform in absence of sunlight. The reasons of this perception are many. Firstly, there have many reports of failure of SPV systems specially in rural areas. Though the main reason for these failures has been lack of maintenance of batteries and lack of availability of spare parts in the rural areas but a general impression has gained ground that SPV systems are not reliable and do not work properly.

Secondly, there is a *lack of understanding* of the technology underlying the operation of these products and hence there is *little confidence* in the system's capability. This indicates that there is an urgent need for customer education so that a favourable impression can be created in the minds of the public.

On the other hand, respondents in most of the organisations were aware about Solar Glowsigns because either they had seen the actual product installed in the city or had been earlier contacted by some manufacturer of these glowsigns. However, a majority of them had doubts about the performance of the system and reasons are the same as in case of individuals. This reinforces the conclusion that a major image improvement (of SPV products) exercise is called for.

### 6.1.2 Solar Cap

Potential buyers perceive Solar Cap as a *trendy* product which has some *image building potential*. People feel that wearing a Solar Cap portrays an image of being technologically aware and environment friendly. It was found that purchase intention for the cap is not related to the actual age of the respondent but is related to his cognitive age, which is reflected in his degree of *venturesomeness*. Solar Cap has unconventional looks and hence calls for a bold, enterprising and outgoing personality for adoption. This implies that fashion conscious people who keep up with the changes in fashions and trends are more likely to buy it.

Apart from the image value, cap's *functional value* was also acknowledged by the respondents and it was found that people who sweat and feel hot in the head or people who rate the feature of having a fan in the cap as a major advantage are more likely to buy it.

It was found that people with *technical educational background* are more likely to purchase the cap. This is contrary to the results for Charger and Ventilator. The possible reason for failing of hypothesis in case of Charger and Ventilator is that the product

concept is relatively simple to understand and therefore educational background has no bearing on the purchase decision. While in case of Solar Cap common concerns were: "How the fan would operate on the head?", "Wouldn't hair get entangled in the fan?", etc. So it appears that engineers could understand the concept better and could understand its working once the photograph was shown and hence the dependence.

Respondents across all income groups felt that the *price* of cap was very high and a negative correlation was obtained between price and purchase intention. As a result it may be concluded that price could prove to be a deterrent in the success of Solar Cap.

### 6.1.3 Automotive Solar Charger and Solar Car Ventilator

Potential buyers perceive Charger and Ventilator as *utility products* and do not associate any image building value to them. Purchase intention for these products was found to be associated with the *car usage pattern*. People who take out their cars occasionally or only on weekends are more likely to be the potential customers for Charger. This will also include people who use office-cars for commuting between residence and office and use their personal cars only occasionally. Similarly, people who have to park their cars under Sun for long hours (due to lack of shaded parking space or due to nature of work) and do not have AC in their cars to take care of the high temperature inside the car are likely to purchase Ventilator. This means office-goers (in office areas lacking covered car parking space and those shopkeepers and businessmen who have to park their cars in the open are potential customers for Ventilator.

*Educational background* (refer section 6.1.1) and *age* were found to have no association with purchase intention. People rated attributes 1 and 3 ( 'gives freedom from starting

trouble' and 'extends battery life' for Charger and 'provides comfort by reducing temperature inside the car' and 'independence from battery for operation' for Ventilator) as major advantages thus showing that they perceive these products as having *high functional value*. This implies that the advertising campaign should highlight the utility of these products rather than anything else and should project these two products as utility products. Also, average rating of price (on a five point scale) was 2.9 for Charger and 2.83 for Ventilator, thereby indicating that for these products utility justifies the cost. Buying intention was also found to be independent of income of the respondents.

It was found that while purchasing a car accessory people normally give more importance to *'value for money'* and *'functional value'* and less importance to *'fashion/trend'*. This was also found to be true in case of these two solar products thereby indicating that people treat them as no different from any other car accessory. This is also supported by the fact that a large number of people indicated that they would prefer to buy these products at a car accessory shop. Analysis shows that people consider *cost*, *performance* and *durability* as very important factors while choosing among brands of car accessories while relatively lower importance is given to *brand name*, *guaranty/warranty* and *reparability*. This knowledge of customer's evaluation system will help in providing the direction for product improvement efforts and increase the chances of the product becoming a success.

### 6.1.4 Solar Glowsigns

Potential buyers felt that Solar Glowsigns have a potential of portraying an *image of being environment friendly* and hence marketing efforts should be directed towards emphasising

this aspect of Solar Glowsigns. There was no difference in purchase intention of polluting and non-polluting companies. Also purchase intention was found to be independent of the nature of the company (whether it is in FMCG or service sector or not). A possible reason for this could be that requirement of companies in FMCG and service sector is for very large and brightly illuminated signages and Solar Glowsigns do not suit such requirements. Purchase intention was also found to be independent of the ownership of the company (whether it is an MNC or not).

The analysis suggests that purchase intention is independent of annual *advertisement budget* of an organisation, we feel that this may be due to sample bias. It was also found that purchase intention has no dependence on *turnover* of a company, this may be due to higher turnover skew of the sample.

The fact that Solar Glowsigns allow *lighting for ads during peak hours* despite the restrictions imposed by State Electricity Boards (SEB) is a major attraction. This implies that areas where SEBs enforce these restrictions strictly are potential markets and this should be a major criterion for market segmentation. Though *'eye-catcher'* and *'novelty appeal'* have also been rated as advantages but marketing strategy should not lay much emphasis on these because "they are short-lived" and will become inconsequential once the product catches on.

## 6.2 Discussion

This study has attempted to address various issues that are involved in technology oriented new product adoption by individuals and organisations. Purchase of such products generally involves complex decision making process and buyer involvement is

also high. The consumer undergoes a process of evaluation of alternatives (generally substitute products in this case) and then makes a purchase decision.

In such a backdrop, consumer's understanding of the technology involved in the working of the product becomes very important. Also, sometimes there are some pre-conceived notions and apprehensions about the product or the technology. Such notions and doubts are a major hurdle in the adoption of technology based new products. This has profound implications for designing the information dissemination campaign. Care must be taken to create awareness about the technology (involved in the product) prior to introducing such products in the market. Also consumers' specific doubts/apprehensions must be addressed adequately. Demonstrations and product trials may be used to create awareness about the new product.

An effort must be made to target those people who have some felt or latent need for the product. Marketers must analyse as to how the consumers view the new offering in comparison to substitutes or other conventional products. Only if the consumers identify the new product with some generic category of familiar products can the marketing strategy draw upon the buyer behaviour for that product class. However, if the product is such that its use requires the consumers to change their usage pattern and behaviour then a detailed study of consumers' attitude and perception must be made and then the marketing strategy should be formulated accordingly.

The study also indicates that demographic factors must not be the only criteria for market segmentation. Other factors such as consumers' needs, personality characteristics and value system must also be taken into account for better segmentation of the market.

## 6.3 Limitations of the Study

The study has been carried out by using survey method. Arranged personal interviews were conducted in a sample set of organisations to collect the data. Buying behaviour, in case of organisational buyers, is highly complex & often more than one person is involved in the decision making process. Their opinion may also vary radically on certain issues. Since responses were obtained from only one person in each organisation therefore in some cases the responses may not convey an accurate picture of the actual buying process and purchase intentions. Moreover, due to time shortage or other pressures there was a varying degree of commitment of the respondents to fill up the questionnaire thoughtfully. This may have affected the quality of responses. Executives in many of the companies were reluctant to disclose their company's advertisement budget. Finally on persuasion they did give a range but this response might be biased.

In case of individual buyers, intercept interviews were conducted. Investigator bias might have come in either while choosing the respondents or while explaining them about the products. Also since no incentives were offered, the level of motivation to fill up the questionnaire was low. This may have had some adverse impact on the quality of responses.

Other limitations of the study are as follows:

1. There is a general tendency of not giving an affirmative response (in writing) regarding purchase intention. Hence many of the respondents opted for 'will probably buy' choice and this made the task of differentiating between affirmative and

conditional responses (subject to clarification of certain apprehensions regarding security of the systems, design, colour, cost etc.) difficult.

2. There is a general tendency to avoid disclosure of personal information such as age, income & educational qualification (specially in case of less educated individuals). This may have affected the conclusions based on demographic profile of the respondents (in case of individual buyers).

3. Due to unavailability of the actual product, only the product catalogue was shown during the interview, this may have had some effect on respondents' understanding of the product (specially the aesthetics, finishing, weight and size) and hence the rating of certain product attributes and purchase intention may have been affected.

4. Due to time and resource constraints the study was confined to Delhi only. Also, the sample size was small as compared to the total population.

## 6.4 Scope for Future Work

As an extension of this work, the study may be carried out in other major metropolitan cities of India with a larger sample size. With larger sample advanced techniques such as Discriminant Analysis and Cluster Analysis may be used. This will help in arriving at results that are more representative of the actual market conditions and will lead to a better understanding of the market. This will in turn facilitate formulation of better marketing strategy.

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# APPENDIX A

This appendix contains excerpts from the product catalogue that was given to the respondents while explaining them about the product.

## SOLAR GLOWSIGNS

If being different is one of the best ways to get noticed today, here is a system to make one stand apart, amidst a crowd or away from it. These glowsigns are stand-alone systems which can be installed anywhere without any cabling or running cost. Easy to maintain & install, these systems have a high potential of attracting attention at crowded traffic crossings or on desolate highways. These glowsigns ensure that the message glows even when the whole city goes dark.

- No State Electricity Board restrictions, specially during peak hours.
- 6 - 8 hrs operation, 3 days autonomy.
- 12V, 80 Ah, low maintenance lead-acid battery.
- 70 W all weather solar module.
- Uses long life, energy efficient CFL .

## Solar Cap

Solar Cap helps to stay cool even while the Sun is right on top. While the sun shines, this cap taps solar power. This power is then used to operate a small fan which cools the face and forehead. There is an option of switching to the battery mode at night.

- Light weight and Stylish.
- Unbreakable plastic fan.
- Solar cell aesthetically blended with the cap.
- Suitable for outdoor activities like golfing, jogging, picnicking, camping, fishing etc.

## Automotive Solar Charger

Prevents dead battery trouble when one tries to start the car after a week or two or on a cold winter morning. Small & compact, this device not only compensates for battery self-discharge but even keeps the battery fully charged by adding a trickle of charge throughout the day so that the car engine starts immediately.

- Can be connected directly to the battery terminals or the cigarette lighter socket.
- LED indication for charging .
- Extends battery life.

## Solar Car Ventilator

With most parking spaces being without shade, stepping into an oven like car is a nightmare. With the above product, one can leave the car parked outside and the sun will cool its inside. A mini solar module fitted in the car runs a fan, which removes the hot air inside the car and lets in fresh air .

- Works on Solar energy / Ni-Cd battery (charged by solar energy)
- Does not obstruct view.
- Completely tamper proof.

# APPENDIX B

## Questionnaire for
## SOLAR GLOWSIGNS

Please '✓' in appropriate places.

1. As of now is your organisation using glowsigns for advertising ?
   1) Yes
   2) No
   3) Planning to do so
2. What do you think is the potential of attracting attention through glowsigns ?
   1) High
   2) Medium
   3) Low
   4) Don't know
3. The concept of Solar Glowsigns is
   1) Absolutely new to me
   2) Had faint idea about it
   3) Very familiar to me
4. Before this interaction , from where did you get the information about this product ?
   1) Not applicable
   2) TV / Radio
   3) Newspapers / Magazines
   4) Manufacturer of these products
   5) Actual product
   6) Ad agency
   7) Exhibition
   8) Other (pl specify)
5. What is your opinion about the following attributes associated with Solar Glowsigns ?
   Put only one '✓' in each row .

| Attribute | Major Advantage | Advantage | Neither adv. nor disadv. | Disadv. | Major Disadvantage |
|---|---|---|---|---|---|
| No problems of DESU restrictions on lighting for ads during peak hours. | | | | | |
| Automatic on/off | | | | | |

| Attribute | Major Advantage | Advantage | Neither adv. nor disadv. | Disadv. | Major Disadvantage |
|---|---|---|---|---|---|
| depending on light conditions | | | | | |
| Novelty appeal | | | | | |
| Eye-catcher | | | | | |
| No cabling/minimal cabling | | | | | |
| Price | | | | | |

6. Do you think that using Solar Glowsigns will help in highlighting your concern for environment & will portray an **environment-friendly** image ?
   1) Very True
   2) Quite True
   3) Somewhat True
   4) Not necessarily so
   5) Not True
7. Our organisation

**Solar Glowsigns**

   1) will definitely opt for _____
   2) will probably opt for _____
   3) probably won't opt for _____
   4) will not opt for _____
   5) don't know _____
8. Regarding the performance of Solar Glowsigns in winters / rainy season / cloudy days, I think they
   1) would function
   2) may / may not function
   3) would not function
   4) don't know

9. Do you have any other apprehensions regarding this product ?

A) _____

B) _____

C) _____

## GENERAL

Please '✓' in appropriate places.

1. What is the nature of your business ?

| | | |
|---|---|---|
| 1) Auto manufacturing. | 5) Tobacco | 9) White goods |
| 2) Advertising agency | 6) Beverages | 10) Hotel |
| 3) Information Technology | 7) Tyres | 11) Other |
| 4) Paints | 8) Lubricants | |

2. What is the approximate annual turnover of your organisation ?

| | |
|---|---|
| 1) Less than 25 cr. | 4) 100 - 250 cr. |
| 2) 25 - 50 cr. | 5) 250 - 500 cr. |
| 3) 50 - 100 cr. | 6) > 500 cr. |

3. What is the approximate annual advertising / promotional budget of your organisation?

| | | |
|---|---|---|
| 1) < 10 lakh | 4) 50 - 100 lakh | 7) 10 - 25 cr. |
| 2) 10 - 25 lakh | 5) 1 - 5 cr. | 8) 25 - 50 cr. |
| 3) 25 - 50 lakh | 6) 5 - 10 cr. | 9) > 50 cr. |

4. Please fill up the following details :

Name : _____

Designation & Dept. : _____

Company Address : _____

Telephone : _____

Fax : _____

*THANK YOU FOR YOUR KIND CO-OPERATION*

# APPENDIX C

## Questionnaire for

## SOLAR COOL CAP

Please '✓' in appropriate places.

1. How often do you wear a cap ?
   1) Always, when going out of house / office
   2) Sometimes
   3) Depends on season / weather
   4) Never
2. Why do you wear a cap ?
   1) For protection from heat / sun
   2) For protection from cold
   3) It is in vogue
   4) It looks trendy
   5) Not applicable
   6) Other (pl specify)
3. On what occasion do you prefer to wear a cap ?
   1) On picnics/outings/tours
   2) While playing
   3) While going to college / school
   4) On job
   5) Other (pl specify)
   6) Not applicable
4. On what occasion would you like to wear a Solar Cool Cap ?
   1) On picnics/outings/tours
   2) While playing
   3) While going to college / school
   4) On job
   5) Other (pl specify)
   6) Not applicable
5. Do you sweat & feel hot in the head while wearing a cap ?
   1) Very True
   2) Quite True
   3) Not necessarily so
   4) Not True
   5) Don't know
6. Do you think that having a fan in the cap will solve the problem ?
   1) Surely
   2) Most probably
   3) Don't think so
   4) Not at all
   5) Don't know

7. Which of the following best describes your nature ?

   1) I am a trendsetter
   2) I closely follow changes in fashion & trends
   3) I take time to change my preferences & go for only well established trends
   4) I seldom change my lifestyle to conform to fashions & trends

8. In your case who is/are likely to **initiate** the idea of buying a cap ?

   1) Self  3) Son / Daughter  5) Friends / Relatives
   2) Spouse  4) Father / Mother  6) Others

9. In your case who is/are likely to **decide** to buy a cap ?

   1) Self  3) Son / Daughter  5) Friends / Relatives
   2) Spouse  4) Father / Mother  6) Others

10. The concept of Solar Cool Cap is

    1) Absolutely new to me
    2) Had faint idea about it
    3) Very familiar to me

11. Before this interaction, from where did you get the information about these products ?

    1) Not applicable  4) Manufacturer of these products  7) Shop
    2) TV / Radio  5) Exhibition  8) Other (pl specify)
    3) Newspapers / Magazines  6) Friends / Relatives

12. Following is a list of attributes associated with **Solar Cool Cap**. As a prospective buyer please rate the extent of advantage/disadvantage of each attribute.

| **Attribute** | **Major Adv.** | **Advantage** | **Neither adv. nor disadv.** | **Disadv.** | **Major Disadv.** |
|---|---|---|---|---|---|
| Adds to the comfort by providing ventilation & air circulation | | | | | |
| Eye-catcher | | | | | |
| Trendy | | | | | |
| No running cost | | | | | |
| Price | | | | | |

13. Use of Solar Cool Cap portrays an image of being _____

| | Technologically aware | Environment friendly |
|---|---|---|
| Very True | ____ | ____ |
| Quite True | ____ | ____ |
| Somewhat True | ____ | ____ |
| Not necessarily so | ____ | ____ |
| Not True | ____ | ____ |

14. I think, I

| | Solar Cool Cap |
|---|---|
| will definitely buy | ____ |
| will probably buy | ____ |
| probably won't buy | ____ |
| will not buy | ____ |
| don't know | ____ |

15. Where would you possibly buy **Solar Cool Cap** ?

1) Sports gear shop
2) Departmental store
3) Garments shop
4) Shop exclusively for solar products
5) Through Teleshopping
6) Through home visit of salesman
7) Other (pl specify)
8) Not applicable

16. What additional features do you feel Solar Cool Cap should have ?

_____

17. Do you use a helmet. If yes, do you think a solar energy operated fan, fitted in the helmet, would be of some use ?

1) Don't use helmet
2) Yes
3) May be
4) No
5) Don't know

## GENERAL

The following questions are for statistical information only.

Please '✓' in appropriate places.

1. What age group are you in ?

| | | |
|---|---|---|
| 1) Upto 15 | 4) 26 - 30 | 7) 41 - 45 |
| 2) 16 - 20 | 5) 31 - 35 | 8) 46 - 50 |
| 3) 21 - 25 | 6) 36 - 40 | 9) Above 50 |

2. Sex : [ ] Male [ ] Female

3. What is the highest level of formal education that you have completed / are presently undergoing ?

| | | |
|---|---|---|
| 1) Less than high school | 4) Engineering | 7) MBA |
| 2) High school | 5) Medical | 8) Law |
| 3) Graduation | 6) CA/CS/ICWA | 9) Other |

4. What is your occupation ?

| | | |
|---|---|---|
| 1) Executive / Managerial | 4) Teacher / Professor | 7) Not employed |
| 2) Professional / Technical | 5) Business | 8) Retired |
| 3) Marketing / Sales | 6) Student | 9) Other |

5. Choose the income bracket which comes closest to describing your <u>total annual family</u> income :

   1) Upto Rs. 1 lakh
   2) Rs. 1,00,001 - 3,00,000
   3) Rs. 3,00,001 - 5,00,000
   4) Rs. 5,00,001 - 10,00,000
   5) Above Rs. 10 lakh

6. Please give the following details :

   Name : _____

   Address : _____

   Telephone:- Office: Residence:

*THANK YOU FOR YOUR KIND CO-OPERATION*

# APPENDIX D

## Questionnaire for

## AUTOMOTIVE SOLAR CHARGER AND SOLAR CAR VENTILATOR

Please '✓' in appropriate places.

1. What is the make of your car ?

   1) Premier Padmini
   2) Ambassador
   3) Maruti 800 / Omni
   4) NE 118 (Premier)
   5) Contessa
   6) Cielo
   7) Esteem / Maruti 1000
   8) Other

2. What is the model of your car ?

   1) 1980 or earlier
   2) 1981 - 85
   3) 1986 - 90
   4) 1991 - 95
   5) 1996 or later

3. How often do you take out your car ?

   1) Daily
   2) Twice/thrice a week
   3) Only on week ends
   4) Once in 2 weeks
   5) Once a month
   6) None of these

4. Your car is 1) AC 2) Non - AC

5. What is the duration for which <u>your car</u> is parked under sun ?

   1) Not at all
   2) Upto 1 hr.
   3) 1 - 3 hr.
   4) 3 - 5 hr.
   5) 5 -7 hr.
   6) Above 7 hr.

6. In your case who is/are likely to **<u>initiate</u>** the idea of buying a car accessory ?

   1) Self
   2) Spouse
   3) Son / Daughter
   4) Father / Mother
   5) Friends / Relatives
   6) Others

7. In your family who is/are likely to **<u>decide</u>** to buy a car accessory ?

   1) Self
   2) Spouse
   3) Son / Daughter
   4) Father / Mother
   5) Others

8. Why do you buy car accessory? Please give ratings for your reasons. <u>Use a scale of 1 to 5 where 1 → Least important & 5 → Most important. (Put only one '✓' in each row)</u>

| Reason | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Luxury / Comfort | | | | | |
| Enhances prestige / image | | | | | |
| Provides real value for money | | | | | |
| It is fashionable / trendy | | | | | |
| Functional value | | | | | |
| Aesthetics | | | | | |

9. Rate the factors that you generally take into account while choosing among brands of car accessories. Use a scale of 1 to 4 where 1 → Least important & 4 → Most important. ( Put only one '✓' in each row )

| Factors | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Durability | | | | |
| Guaranty / warranty | | | | |
| Performance | | | | |
| Reparability | | | | |
| Cost | | | | |
| Brand Name | | | | |

10. The concept of Automotive Solar Charger / Solar Car Ventilator is

| | **Automotive Solar Charger** | **Solar Car Ventilator** |
|---|---|---|
| Absolutely new to me | ____ | ____ |
| Had faint idea about it | ____ | ____ |
| Very familiar to me | ____ | ____ |

11. Before this interaction , from where did you get the information about these products?

1) Not applicable
2) TV / Radio
3) Newspapers / Magazines
4) Manufacturer of these products
5) Exhibition
6) Friends / Relatives
7) Shop
8) Other (pl specify)

12. Following is a list of attributes associated with **Automotive Solar Charger** . As a prospective buyer please rate the extent of advantage/disadvantage of each attribute.

| Attribute | Major Advantage | Advantage | Neither adv. nor disadv. | Disadv. | Major Disadvantage |
|---|---|---|---|---|---|
| Gives freedom from starting trouble | | | | | |
| Maintenance free | | | | | |
| Extends battery life | | | | | |
| No running cost | | | | | |
| Price | | | | | |

13. Following is a list of attributes associated with **Solar Car Ventilator**. As a prospective buyer please rate the extent of advantage/disadvantage of each attribute.

| Attribute | Major Advantage | Advantage | Neither adv. nor disadv. | Disadv. | Major Disadvantage |
|---|---|---|---|---|---|
| Provides comfort by reducing temperature inside the car | | | | | |
| Maintenance free | | | | | |
| Independence from battery for operation | | | | | |
| Trendy | | | | | |
| No running cost | | | | | |
| Price | | | | | |

14. Use of **Automotive Solar Charger** portrays an image of being ------

| | Technologically aware | Environment friendly |
|---|---|---|
| Very True | ____ | ____ |
| Quite True | ____ | ____ |
| Somewhat True | ____ | ____ |
| Not necessarily so | ____ | ____ |
| Not True | ____ | ____ |

15. Use of **Solar Car Ventilator** portrays an image of being -------

| | Technologically aware | Environment friendly |
|---|---|---|
| Very True | ___ | ___ |
| Quite True | ___ | ___ |
| Somewhat True | ___ | ___ |
| Not necessarily so | ___ | ___ |
| Not True | ___ | ___ |

16. I think, I

| | Automotive Solar Charger | Solar Car Ventilator |
|---|---|---|
| will definitely buy | ___ | ___ |
| will probably buy | ___ | ___ |
| probably won't buy | ___ | ___ |
| will not buy | ___ | ___ |
| don't know | ___ | ___ |

17. Where would you possibly buy Automotive Solar Charger / Solar Car Ventilator ?

1) Car accessory shop
2) Departmental store
3) Shop exclusively for solar products
4) Through Teleshopping
5) Through home visit of salesman
6) Other (pl specify)
7) Not applicable

18. Regarding the performance of Automotive Solar Charger in winters / rainy season / cloudy days, I think it

1) would function
2) may / may not function
3) would not function
4) don't know

19. What additional features do you feel Automotive Solar Charger / Solar Car Ventilator should have ?

_____

# APPENDIX E

## Sample Characteristics of Individual Buyers

Tables E1, E2, E3 and E4 present the sample characteristics of individual buyers in terms of age, educational qualifications, occupation and total annual family income.

**Table E1 : Distribution by Age**

| Age (in Years) | Solar Cap | Charger and Ventilator |
|---|---|---|
| 16-20 | 18 | 7 |
| 21-25 | 47 | 30 |
| 26-30 | 23 | 30 |
| 31-35 | 3 | 12 |
| 36-40 | 5 | 7 |
| 41-45 | 3 | 6 |
| 46-50 | 1 | 7 |
| Above 50 | 0 | 1 |

**Table E2 : Distribution by Educational Qualification**

| Educational Qualification | Solar Cap | Charger and Ventilator |
|---|---|---|
| Less than high school | 0 | 0 |
| High school | 16 | 11 |
| Graduation | 41 | 55 |
| Engineering | 19 | 11 |
| Medical | 0 | 5 |
| CA/CS/ICWA | 5 | 2 |
| MBA | 12 | 9 |
| Law | 3 | 3 |
| Other | 4 | 4 |

**Table E3 : Distribution by Occupation**

| Occupation | Solar Cap | Charger and Ventilator |
|---|---|---|
| Executive / Managerial | 22 | 29 |
| Professional / Technical | 9 | 8 |
| Marketing / Sales | 10 | 5 |
| Teacher / Professor | 2 | 1 |
| Business | 10 | 38 |
| Student | 38 | 16 |
| Not employed | 3 | 0 |
| Other | 6 | 3 |

## Table E4 : Distribution by Total Annual Family Income

| Annual Family Income (in Rs.) | Solar Cap | Charger and Ventilator |
|---|---|---|
| Upto 1,00,000 | 15 | 1 |
| 1,00,001 - 3,00,000 | 63 | 64 |
| 3,00,001 - 5,00,000 | 16 | 30 |
| 5,00,001 - 10,00,000 | 5 | 5 |
| Above 10 lakh | 1 | 0 |